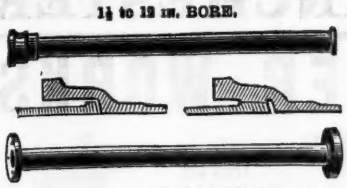
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1642.] LONDON, OCTOBER 30, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.

Telegrams:

"BONLEA, STOCKTON-ON-TEES."

"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

WOLSTON'S

TORBAY PAINTS

Special Quotations to Gas Companies.

DARTMOUTH, DEVON.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes

3¾ cubic feet per hour.

Gives a light of

70 to 80 candle power.

Brilliant Light.

Perfectly Steady and

Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 8s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,

14, PALMER STREET, WESTMINSTER, LONDON,

Near St. James's Park Station.

CASH PREPAYMENT METERS.

THE "POSITIVE" PREPAYMENT SLOT METER.

Noted for Strength and Simplicity of Construction.

Used by many Corporations and Gas Companies.

Material and Workmanship of the best.

Prices and full Particulars on application.

SAWER & PURVES, MANCHESTER.

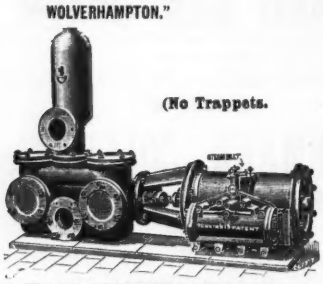
PUMPS FOR GAS & WATER WORKS.

FIRST AWARDS EVERYWHERE.

TELEGRAMS: EVANS WOLVERHAMPTON."

APPLY FOR CATALOGUE NO. 8.

TRADE MARK.



(No Trappets.

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

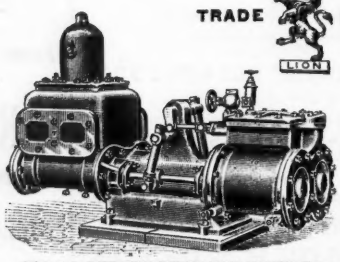


Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

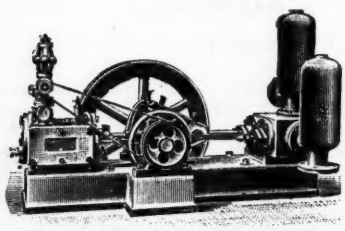


Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

JOSEPH EVANS & SONS, Hydraulic Engineers,

WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

AN APPARATUS WHICH PERFORMS THE COMBINED DUTIES OF

TAR-EXTRACTOR, WASHER, AND SCRUBBER.

It requires **NO MOTIVE POWER,** is simple in construction, automatic in action, and readily adjusted to deal efficiently with varying makes of gas. By ensuring minute and frequent subdivision of the gas in its passage through the numerous light liquor seals, the whole of the purification up to the inlet of the purifiers (including the removal of tarry matters) is accomplished in the **ONE VESSEL,** without excessive back pressure—this not exceeding the pressure often accumulated by a small washer working in combination with a scrubber.

THE "CHARLES HUNT" PATENT WASHER

The gas enters at the bottom, and passes through a large number of small tubes into a series of light steel troughs, which have finely-perforated edges submerged in liquor, and, escaping through these perforations in minute streams to the next chamber, a similar operation is repeated until the top is reached.

By contact with the strong liquor on the lower trays, the gas is denuded of CO_2 and tarry matters, and in the succeeding trays the removal of the ammonia is completed—the gas passing finally through clean water in the top tray, and thence to the outlet main. The water supply can be exactly regulated to give liquor of a required strength; and the seals can be readily adjusted by means of external regulators to suit the volume and condition of the gas.

SOLE MAKERS:

Westminster Office: 16, GT. GEORGE ST.

S. CUTLER & SONS,

Telephone: 5059. *Telegrams:* "RETORTUS, LONDON."

PROVIDENCE WORKS, MILLWALL, LONDON.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

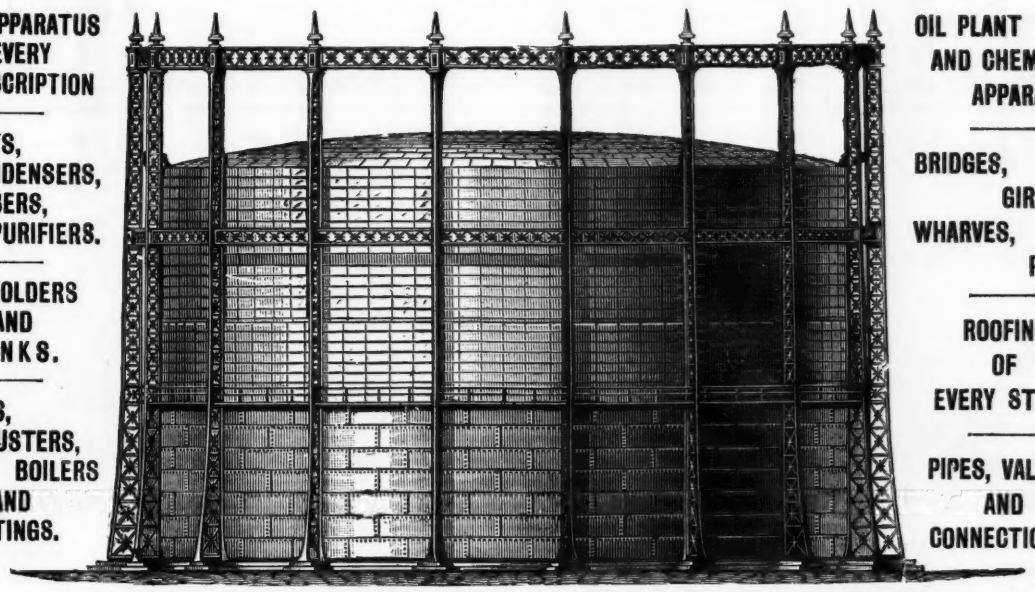
Telegrams: "GASOMETER GLASGOW." GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

W. H. ALLEN & CO.,

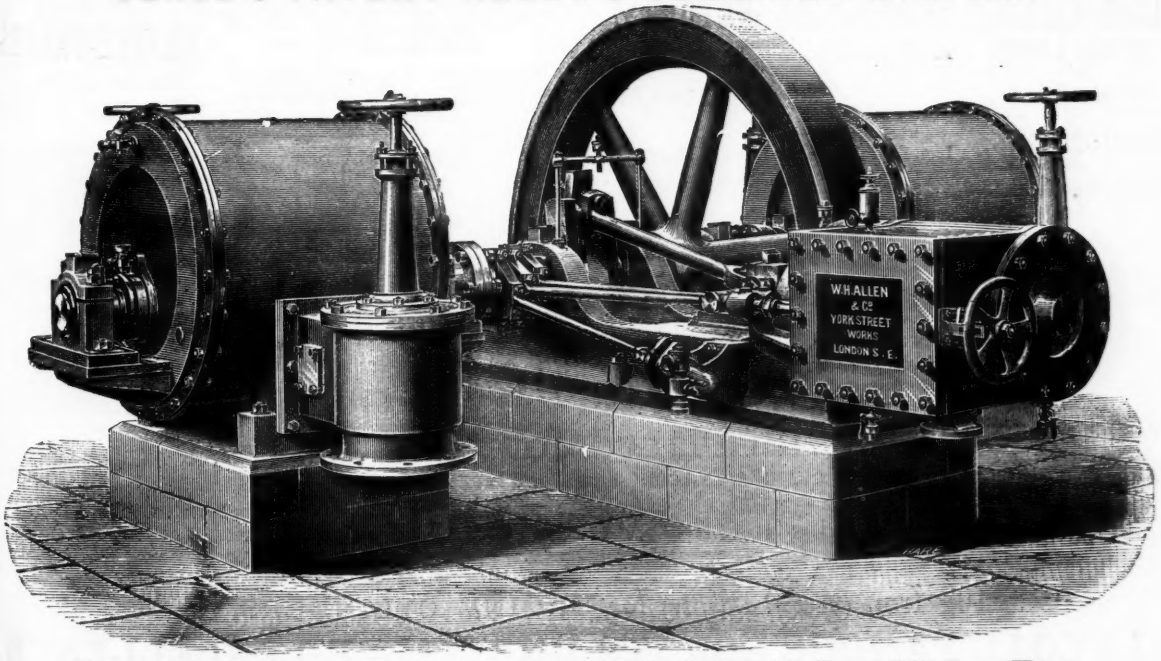
YORK STREET WORKS, LAMBETH, LONDON, S.E.,

And of QUEEN'S ENGINEERING WORKS, BEDFORD,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

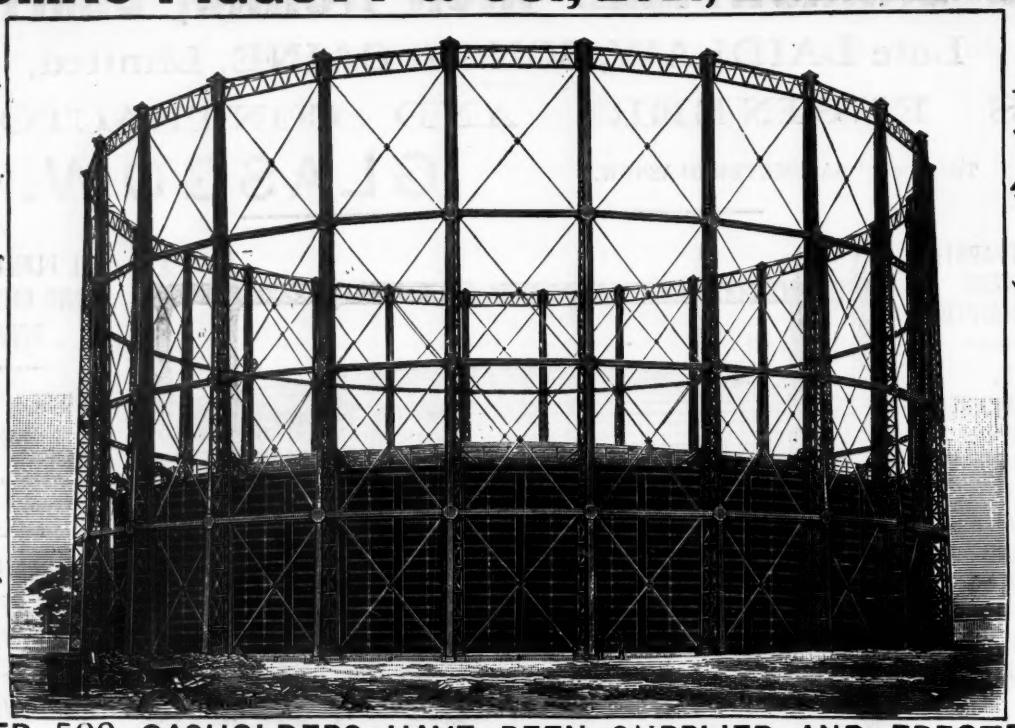


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

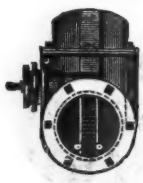
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.



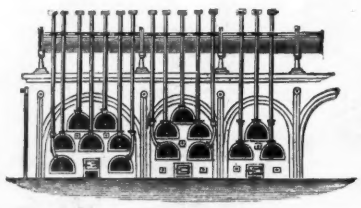
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

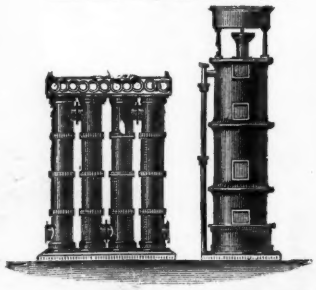
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS, SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE-VALVES

for working Purifiers,

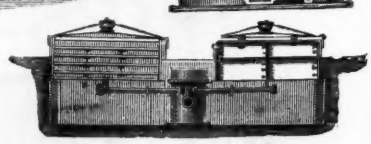
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

Telegraphic: "Fortress, Donnington, Salop."

C. & W. WALKER,

Telegraphic: "Fortress, London."

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

London Office: 10, FINSBURY SQUARE.

PURIFIERS with Planed Joints.

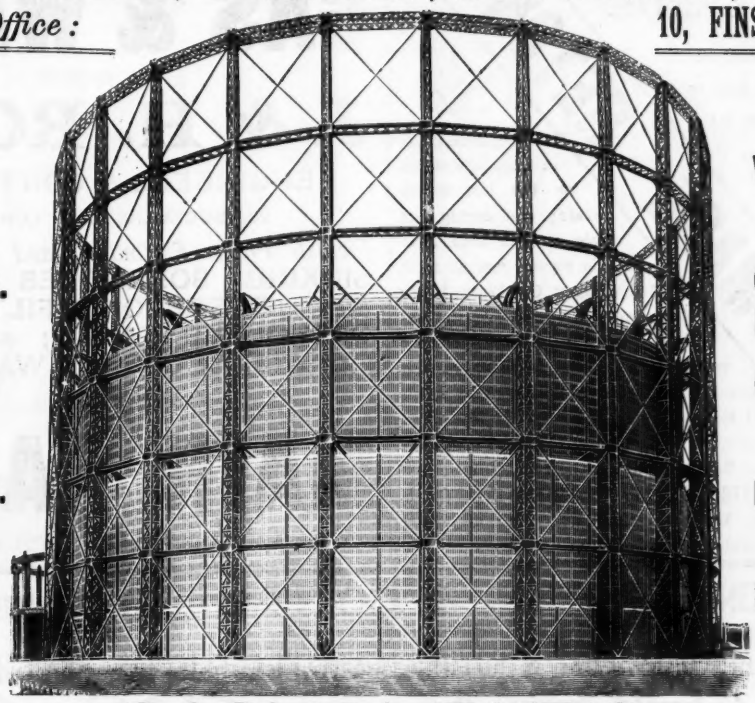
TOWER SCRUBBERS.

PURIFYING-MACHINES FOR AMMONIA.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



GASHOLDERS.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES, &c., &c., &c.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892.

Sole Makers of **WECK'S** Patent CENTRE-VALVE, & **CRIPPS'** Patent HYDRAULIC MAIN VALVE.

What is the Continuous?

IT IS A PREPAYMENT ATTACHMENT

THAT IS

UNFAKEABLE & UNBREAKABLE

BY HAND OR COIN PRESSURE.

THE MONEY IN THE BOX IS ALWAYS EXACTLY CORRECT WITH THE AMOUNT OF GAS CONSUMED.

For Particulars, apply to

The Automatic Gas-Meter Co., LIMITED,

49, QUEEN VICTORIA ST., LONDON.

1, UPPER BROOK STREET, AND 6, ROSAMOND STREET EAST, MANCHESTER.

5, MERRION STREET, LEEDS.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

TELEGRAPHIC ADDRESS
ROBUSTNESS, LONDON."

GAS & WATER
WORK
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY LONDON, E.C.

furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

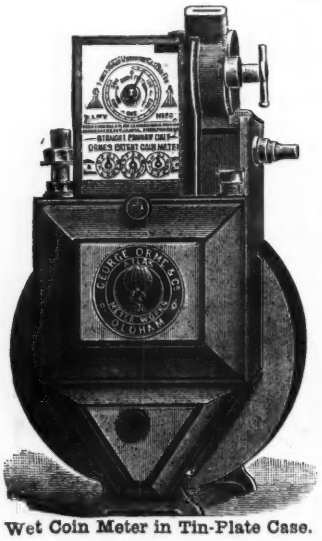
GEORGE ORME & Co.
ATLAS METER WORKS, OLDHAM.

ORME'S PATENT COIN PREPAYMENT METERS.

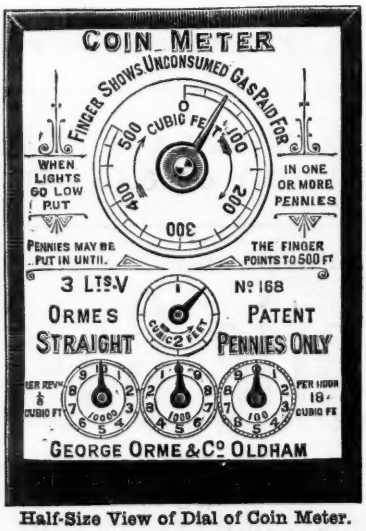
Wet Meters in Cast-Iron and Tinplate Cases. Dry Meters in Tinplate Cases.

NEW PATENTED ARRANGEMENT FOR ALTERING THE SELLING PRICE OF GAS.

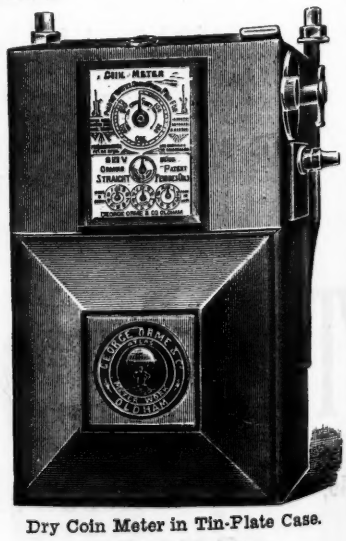
Full Particulars sent upon Application.



Wet Coin Meter in Tin-Plate Case.



Half-Size View of Dial of Coin Meter.



Dry Coin Meter in Tin-Plate Case.

Telegraphic Address: "ORME, OLDHAM." A.B.C. Code (4th Edition) used. National Telephone: No. 93, Oldham.

SEND FOR PRICE LISTS OF

BRAY'S

PATENT FLAT-FLAME LANTERNS,

From 30 to 1100 Candle Power.

THEY ARE SUITABLE FOR GAS OF EVERY CANDLE POWER,

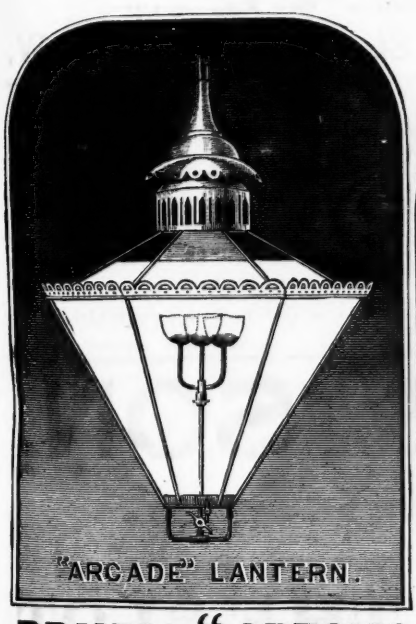
MADE ENTIRELY OF COPPER.

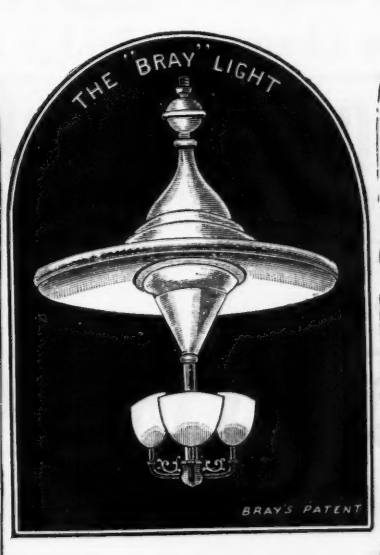
THE "BRAY" REFLECTING LIGHT

Is an unequalled combination of SIMPLICITY, CHEAPNESS, and EFFICIENCY.

GIVES REMARKABLE LIGHTING VALUE FOR GAS CONSUMED.

SEND FOR PRICES AND PARTICULARS.





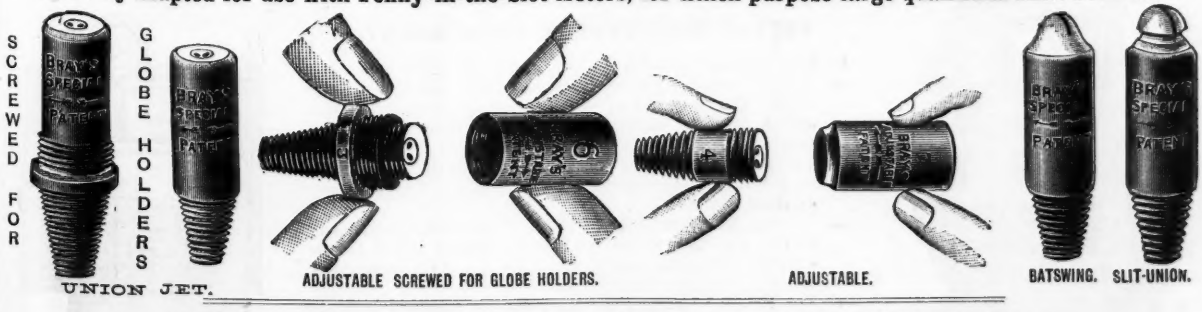
BRAY'S "SPECIAL" AND "ADJUSTABLE" BURNERS

Are the best in the Market for general use, and are very moderate in price.

It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "Specials" and "Adjustables" would yield with the same consumption of Gas.

Gas Managers should try them on Consumers' Fittings; and they would see at once how to compete more effectively with the Electric Light.

Specially adapted for use with Penny-in-the-Slot Meters, for which purpose large quantities have been sold.



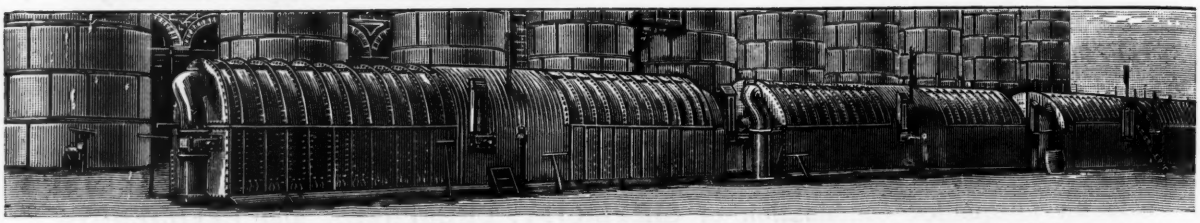
SEND FOR PRICES AND PARTICULARS.

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

☛ **484** of these Machines (capable of dealing with **464,490,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have **30** of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

Sole Agents in Great Britain for Marshall's Patent Tar Extractor.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

R. LAIDLAW & SON,

Gas-Meter Makers.

PATENT PENNY-IN-THE-SLOT

WET AND DRY

PREPAYMENT GAS-METERS.

WET METER.

Advantages claimed for our

PATENT PREPAYMENT ATTACHMENT.

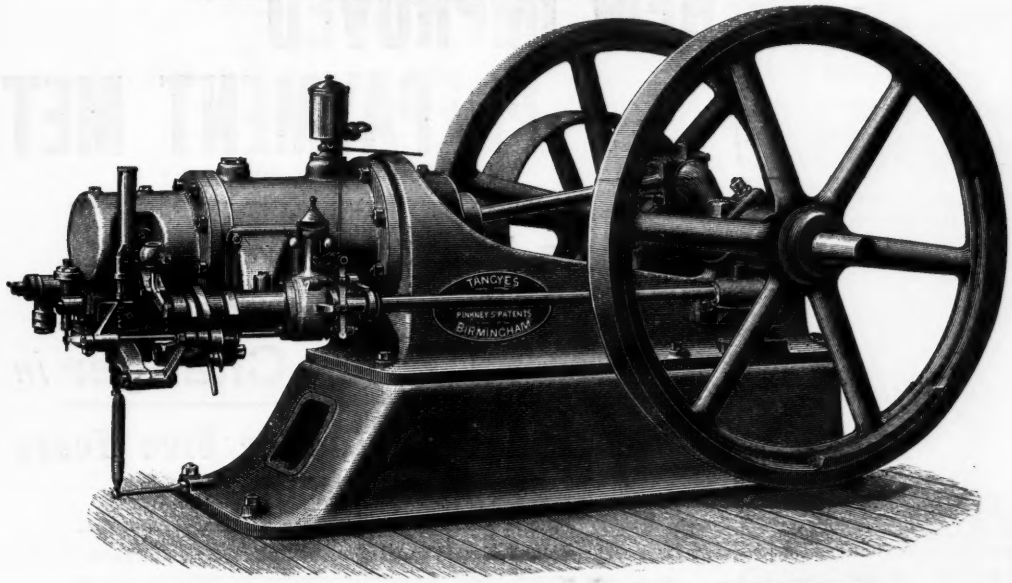
1st—It is the most compact arrangement in the market.
2nd—All the working parts are mounted on a strong cast Brass Frame, the front end of which carries an additional Index and Pointer to show the number of cubic feet of Gas prepaid.
3rd—The whole attachment can be easily adapted to the ordinary Wet and Dry Meters, without interfering with any existing parts.
4th—The Patent Circular Feed Rack gives a POSITIVE quantity of Gas for each Penny, so that the money found in the cash-box will always agree with the value of Gas consumed, as shown by the ordinary index.
5th—The Patent Circular Feed Rack can be adjusted *in situ* to suit changes made in the price of Gas.

DRY METER.

EDINBURGH: SIMON SQUARE WORKS. | **GLASGOW:** ALLIANCE FOUNDRY. | **LONDON:** 6, LITTLE BUSH LANE.

TANGYES GAS-ENGINE

"OTTO" PRINCIPLE. PINKNEY'S PATENTS.



THE 12-HORSE POWER (NOM.) ENGINE.

ENGINES OF ALL SIZES.

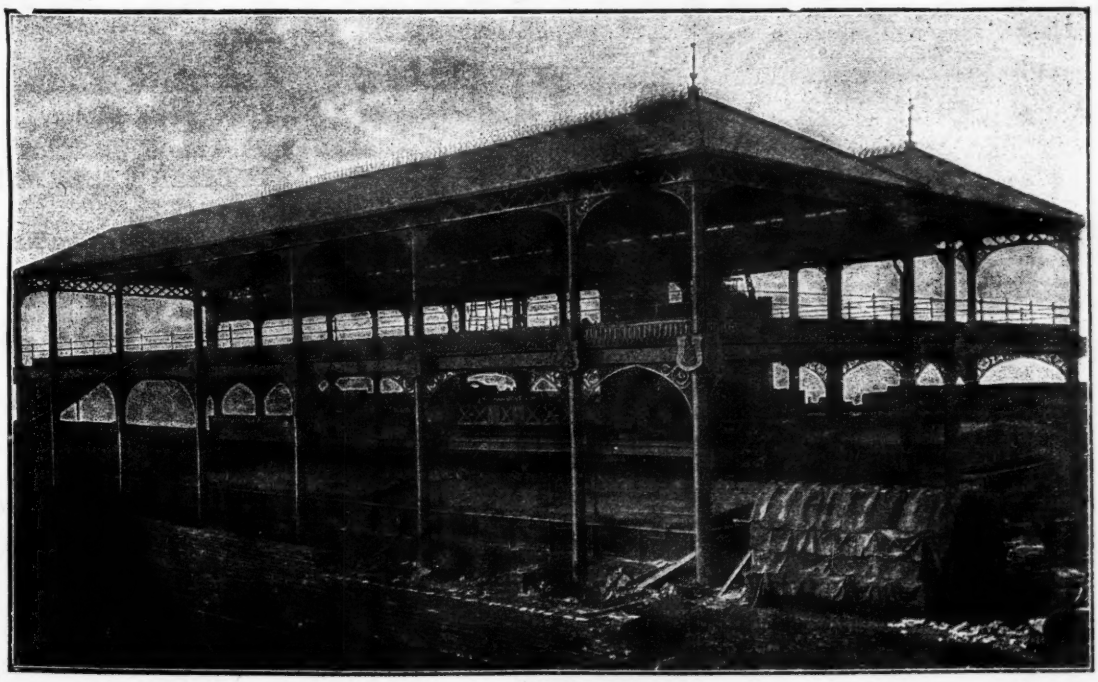
TANGYES LIMITED, BIRMINGHAM;

AND AT

LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, BILBAO, ROTTERDAM, and CALCUTTA.

Telegrams: "TANGYES, BIRMINGHAM." No. 98 E.

W. C. HOLMES & Co.



Purifier-Houses erected at Huddersfield to designs by Mr. W. R. HERRING.

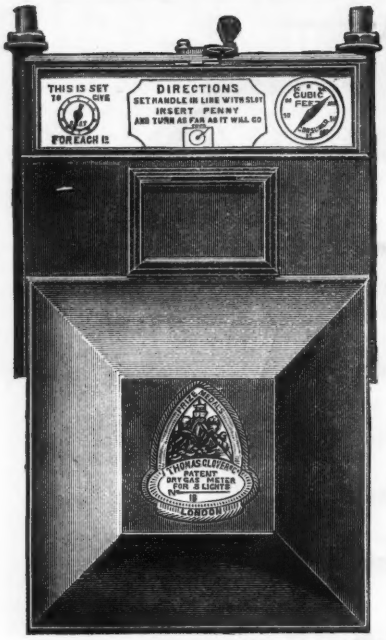
Makers of Retort Ironwork, Condensers, Patent Scrubber-Washers, Purifiers, Gasholders of all sizes, and Gas Plant and Constructional Ironwork of every description.

Works: HUDDERSFIELD.

Telegrams: "Holmes, Huddersfield."

London Office: 80, CANNON ST., E.C. Telegrams: "IGNITOR."

THOMAS GLOVER & CO.'S



NEW IMPROVED PREPAYMENT METER.

(PATENT APPLIED FOR.)

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

Guaranteed for One or Five Years at Buyer's Option.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

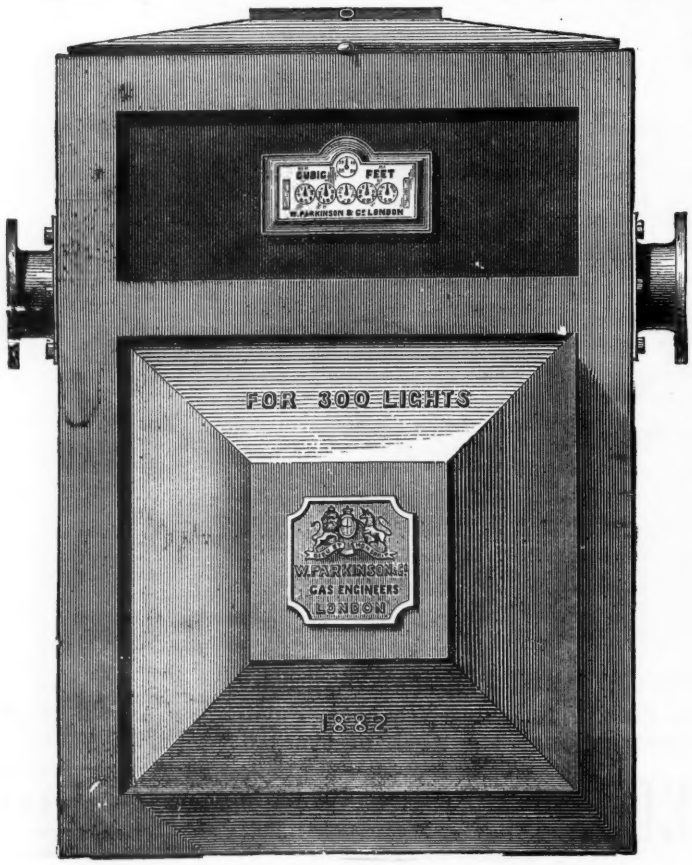
BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The **DIAPHRAGMS** are of the Finest **PERSIAN SHEEP SKINS.**

The **CASES** are of the Best **CHARCOAL-TINNED PLATES.**

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS.

PRESSURE & EXHAUST REGISTERS

MOTIVE POWER METERS,

Test Gasholders, Experimental Apparatus, &c.

PRESSURE GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE AND PRICE LIST
Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS METERS."

10, MAWSON'S CHAMBERS, DEANSGATE. **MANCHESTER.** Telegraphic Address: "PRECISION."

[See also Advt. p. 848.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The City and Guilds of London Technological Examinations 815
Sir F. Bramwell on Theory, Practice, and Research 816
The Meeting of the Midland Association 816
The Incandescent Gas-Burner and its Vilifiers 816
The Lesson of Pullman 817

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 817
Electric Lighting Memoranda 817
Water Acts for 1894 818

COMMUNICATED ARTICLES:—

Notes on Herr Niemann's Paper on the Strains in Gasholder Guide-Framing. By F. S. Cripps, Assoc.M.Inst.C.E. 820
On Unaccounted-for Gas. By L. T. Wright, Assoc.M.Inst.C.E. . . . 821

TECHNICAL RECORD:—

Midland Association of Gas Managers—Quarterly Meeting in Birmingham—General Report 823
The Innoxiousness of the Incandescent Gas-Light 823
Oil-Gas 826
Statistics of Water Gas 828

LEGAL INTELLIGENCE:—

High Court of Justice—Queen's Bench Division—East London Water-Works Company *v.* Kyffin 829
Birmingham Quarter Sessions—The Rating of Gas and Electric Lighting Plant 829

MISCELLANEOUS:—

Some Notes from America—From Our Own Correspondent 830
The Outrages at the Plymouth Gas-Works—Statements by Trade Unionists 831
A New Gadd and Mason Holder at the Colchester Gas-Works 831
Extensions at the Leeds Corporation Gas-Works—Inauguration of a New Holder 831
The Brewers' Exhibition 832
Meeting of the Ceara Gas Company, Limited 833
Metropolis Water Supply—The Quality of the Water in September . . 833
The Felixstowe Local Board and the Gas and Water Supply 834
The New Reservoir of the Swansea Corporation 834
Notes from Scotland 835
Current Sales of Gas Products 835
Coal Trade Reports 836
Gas and Water Companies' Stock and Share List 836

PARAGRAPHS.—Mr. J. H. Silcox, 818—A Correction, 819—Mr. G. Livesey on the Municipalization of the London Gas Supply, 819—The Alleged Vitiation of the Atmosphere by Incandescent Gas-Burners, 819—The London County Council and the Metropolitan Water Supply, 819—The Directorate of the Georgetown (British Guiana) Gas Company, Limited, 822—Water-Works Extensions at Preston, 828—The Position of the Leicester Corporation Water Supply, 828—The Unification of the Malverns and the Water Supply, 828—The Dewsbury and Heckmondwike Water Board, 828—Fylde Water-Works Company, 828—Wakefield Water Supply, 828—The Bristol Town Council and the Water-Works, 830—Lecture on Gas Lighting at Swansea, 830—The Protection of Gasholders from Frost, 832—Saltash Water Supply, 833—Hexham Gas Supply, 834—Georgetown (British Guiana) Gas Company, Limited, 835—The Liverpool Corporation and the Gas Company, 836—Gas and Electric Lighting at Hastings, 836—Sales of Shares, 836—The Sequel to the Bath-Tax, 836—Colonial Gas Association, Limited, 836—Increased Water Storeage for Lancaster, 837—Disputed Meter Registration at Huddersfield, 837—The Local Government Board and Expenditure on Water-Meters, 837—Proposed Removal of the Works of the Ilfracombe Gas Company, 837.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.

Telegraphic Address: "GASKING LONDON."

Telephone Number: 2759.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 30, 1894.

The City and Guilds of London Technological Examinations.

THE abstract published in last week's JOURNAL of the report of the Examinations Department of the City and Guilds of London Institute showed the steady advance in popularity, and it may be trusted also in usefulness, of this educational agency. So far as the interest of the followers of the gas industry in these examinations is concerned, it may be freely conceded that they constitute an excellent, and indeed the sole available means whereby young men in training for the profession of gas engineering can assure themselves of the validity of their technical studies. We desire to take the opportunity offered by the retirement of Mr. Charles Hunt from the examinership in Gas Manufacture, upon the expiration of his term of office, to bear testimony to the value of his services not only to the Institute but also to the gas industry. Mr. Hunt has deserved well of his own and the rising generation of gas managers, for having maintained at a high, and at the same time a perfectly reasonable level, the standard of proficiency in candidates for examination in Gas Manufacture. We have not the slightest doubt that his successor—Mr. Alfred Colson, of Leicester—will worthily follow the course marked out by his predecessor, and continue to supply in his examination-papers that element of indirect instruction in the points of good gas making which has rendered the papers of the last few years so useful over a far wider region than that to which the scheme of the Institute applies. Nobody has ever said that ability to satisfy the Examiner in Gas Manufacture argues ability to perform all the duties of a gas manager; but it is certain that no young man who could not satisfactorily grapple with the examination-papers of recent years would be qualified to occupy a responsible position in a modern gas-works. Mr. Hunt has had the gratification of seeing the possession of the Institute certificates reckoned among the best of the recommendations of aspirants to managerships; and the indirect effect of his work, if limited to the consideration of the fact that such a standard of proficiency in technical studies exists, must be very beneficial to the industry at large.

The great increase in the number of candidates in Gas Manufacture this year is remarkable. The Examiner is justified in mentioning this fact in his report as being very gratifying evidence of the growing appreciation in which these examinations are held; and it is highly satisfactory that he is able to refer to the quality of the papers as showing that the very large majority of the candidates are in some way or other engaged in the industry. We have always felt a considerable amount of jealousy on this score, because it would clearly be most undesirable for the examination to be misused as a means of encouraging outsiders to pick up from books a smattering of technical knowledge with the object of getting a pass certificate. For this reason, we have in the past criticized the papers with a view to forming a judgment as to how far mere book-reading might be expected to enable candidates to answer the questions set. Latterly there has been no occasion for such criticism, since the papers have been characterized by actuality in a high degree. This is a point to which Mr. Colson will no doubt pay particular attention. Of course, the study of accredited text-books and papers contributed to technical societies, and even, we venture to believe, some of the matter of technical journals of repute, must be commended to the attention of those who would penetrate beneath the routine of gas-making methods, and the objective presentments of familiar apparatus and plant, to their underlying principles and purposes. This, however, is a very different thing from the possible misuse of technical literature merely for "cramming," already hinted at as a thing to be discouraged. The safe guide in this difficulty seems to be the implied rule upon which Mr. Hunt has acted, in adjusting the Ordinary Grade papers to the capacity of candidates to whom the routine of gas making, not to be learnt from print, is familiar, while setting up, in the Honours Grade papers, something which requires study as well as habituation to routine to deal with successfully. It is to be hoped, however, that the admitted tendency of all examiners, which is also confessed by Mr. Hunt, to stiffen their Honours Grade papers, will not be allowed to go too far. The difficulty of preserving an equable standard of knowledge is obvious; but examiners must guard against the insidious temptation to make their questions progressive. They go on year after year; but not the candidates. It is true that, when an examination has been held many times, it is necessary to harden the questions to a certain degree; because the fact of the old papers being available for the guidance of candidates places them every year at a slightly better advantage than their predecessors enjoyed. In this way it is certain that a tangibility and lead have been imparted to the teaching of Gas Manufacture as an examination subject which at one time did not exist. After all legitimate allowance has been made for this consideration, however, the condition of the Institute examinations of being for a pass only, and not competitive, remains to check the temptation to give them a stringency only justifiable where the competition is of a competitive character.

Before leaving the subject of these examinations, a

word or two may be spared here with reference to the examination in Electric Lighting. The Committee have instituted a preparatory test in this much-sought-after subject, which was taken by 689 students of all grades. Last year 439 candidates entered for the two grades then open; and the proportion of failures was 64·9 per cent. Thanks to the preliminary examination this year, for which 287 entered, the percentage of failures was 43·5; showing on the face a marked improvement. It cannot be denied that the rush of candidates into this branch of technics is far in excess of the relative importance of the subject in any of its real aspects. It is significant that there is no extract from the report of the Examiners in Electric Lighting among the other reports; and it would be interesting to know what they really think of their candidates.

Sir F. Bramwell on Theory, Practice, and Research.

Speaking at the prize distribution of the Westminster Technical Institute for the past session, Sir Frederick Bramwell made some pertinent remarks upon the relationship of practice and theory in technics, and also claimed or pure research that respect which the frequenters of technical institutes are not always prepared, by the character of their own studies, to yield to it. A brief notice of Sir F. Bramwell's words on this occasion may be appropriately given here, by way of supplement to what has been said above with regard to the work of the City and Guilds of London Institute. He began his address by recounting his own experience, of a master who "taught him all he could teach, and that embodied a "great deal of practical work, without much theory. The "fact was that theory was not taught by his master, because "he had no theory to teach." This is a broad statement of the only safe kind of teaching in any employment worth doing. First the practice, which shows the learner what the work in hand is, what is to be done, and how to do it. All progress in the arts and industries has begun with the doing of work—with the workman. The time arrives, however, with some workers, but by no means with all, when the man asks himself and others the why and the wherefore of his work. Much of the confusion and misconception respecting the parts played respectively by theory and practice in the advancement of an industry would never arise if this natural succession of the one to the other in the order of time were duly perceived. In point of fact, the worker—the practical man—is the origin and base of all work; but just because he is a man and not a machine, he comes at last to think about what he does, and to reason over it. He does not cease to be practical for all that, but the contrary; for if he is capable of thinking to any purpose, his thoughts tend to make him more practical than ever. It is a mistake, albeit one that is often committed, when the term "practical" is limited in application to the worker who does not think at all, or who, in the differentiation of offices in the modern organization of industries, is relegated to the performance of a part which does not make any demand upon his reflective powers. How absurd this mistake is appears in a moment when it is applied to an example like that of Sir Henry Bessemer and a workman who trundles crucibles to and from a steel converter. Who is the practical man here? The only correct answer is, "Both"—each in his own kind of practice.

The theoretical part of an industry is nothing more than the sum, at a particular period, of the results of the reflections and speculations of men with regard to it. Certain of our technical contemporaries are continually running into pitiable, because wilful and mischievous, error upon this head, and are prone to ask whether the practical men or the professors have done most to improve the steam-engine, and to put similar perfectly idle queries. Of course, it is the practical men who have improved the steam-engine, and the gas-generator, and every other appliance of the mechanical industries; but it is certain that these were thinking men also. Practice precedes theory in the world of industry, as motion may be said to precede deliberation in the animal world. The history of human invention is the tale of men having done one thing after another long before anybody could say definitely why they did them. The practice of gunnery preceded the science of ballistics; chemical industries antedated chemistry; and fighting was familiar enough before the science of war was dreamt of. The lesson of all these examples is much the same: After men have carried the practice of a thing to a certain point of proficiency, and have satisfied themselves that it is worth doing, somebody is sure to begin thinking the matter out. If the thoughts are worth anything, they crystallize eventually into a theory, which is little regarded unless it helps the practice by reducing wastes and openings for error, and aids the practitioner to a perception of the possibilities and limitations of his work. So it may be said that work which it is worth nobody's while to think about is drudgery; and thought about work which is not fruitful of instruction, suggestion, or elucidation is barren, and not properly to be called theorizing.

That only is a noble industry which possesses both a theory and a practice; and to attempt, as some do, to set the two branches of an industry in opposition to one another, is as foolish as it would be to extol the work of a man's hands without reference to the directing brain. Distinct from both the theory and the practice of an industry is the pure science—the search into the truth of Nature for its own sake—which, as represented by Professor Dewar's investigations into the state of matter at temperatures approaching to absolute zero, Sir Frederick Bramwell commended to the respect of his Westminster audience. This was well done; for our strenuous youth need reminding occasionally that the universe is worth studying from another standpoint than that of a grocer who takes no interest in anything which he cannot sell over the counter. It is not so very long ago that wiseacres poked fun at the first Fellows of the Royal Society for devoting their attention to such useless triflings as "the "weighing of ayre." The spirit that inspired these silly jests is still alive and walking the earth. Indeed, it is the Undying Thing itself in one of its manifestations; for it is nothing else than the spirit of Presumptuous Ignorance which it behoves every man to cast behind him in his journey from darkness into light.

The Meeting of the Midland Association.

The Autumn General Meeting of the Midland Association of Gas Managers was held in Birmingham on Thursday last, under the presidency of Mr. R. O. Paterson, of Cheltenham; and the proceedings were of more than average interest. Two excellent papers—by Mr. William Belton, of Shrewsbury, and Mr. J. T. Lewis, of Wellingborough—were read and discussed. Mr. Belton's communication was descriptive of a sulphate-producing and gas-purification process which he has had under development at Shrewsbury for some time past; and this decidedly promising arrangement is certain to be heard of again at no distant date. The importance and fresh interest of Mr. Belton's paper will be perceived when we publish the text and the discussion upon it, which we hope to do very shortly. Mr. Lewis's paper on stoking machinery was of a very suitable character for a District Association meeting. The proceedings concluded with a well-earned vote of thanks to the retiring President, who is succeeded by Mr. George Winstanley, of Coventry. It should be observed that Mr. Paterson ended his presidential career as he began it, by exhorting the members generally to realize their responsibility for maintaining the interest and value of the meetings, and supporting the Secretary in the matter of providing pabulum of the proper kind for these gatherings. It is a piece of counsel that members of other Associations of a similar character would also do well to take to heart; for it is too much the custom to leave with Presidents and Secretaries the onerous task of safeguarding the reputation of these bodies.

The Incandescent Gas-Burner and its Vilifiers.

In another part of the Journal will be found an exhaustive statement respecting the innoxiousness of the incandescent gas-burner, upon the authority of Professor Renk, the Director of the Hygienic Institute of the University of Halle, and Dr. Bunte. It may be trusted that, after this, no more will be heard of such unfair attacks upon this gas appliance as that of the *Electrical Review*, upon which we commented last week. The reason for the hostility of this periodical to the incandescent gas-burner is obvious; but if any doubt could have existed on this score, it is removed by what appears in the current issue, which opens with an editorial entitled "The City Electric Lighting." In this article, the third sentence has the statement that "it can "scarcely be denied that the new incandescent gas-burner "will prove to be a thorn in the City Company's side;

"for notwithstanding the criticism to which it has been "subjected, especially in our own pages, it is too much to "expect that all large consumers of light will either be "made aware of what we have said concerning the Auer-"Welsbach invention, or that even supposing they had "[*sic*], they would not exercise their own judgment in "deciding upon the kind of lighting to adopt. In any "case, it is suicidal policy to shut one's eyes to the fact "that what a contemporary, following in our wake, calls "a bilious-looking contrivance, may, if energetically "pushed, form as serious a rival to incandescent lighting "by electricity, as it has already in Germany." This is a quotation worth reproducing, on account of the bitter-tasting truth which it reluctantly expresses—and badly enough, in point of composition. Whether the description "bilious-looking" can properly be applied to the light of the burner invented by Dr. Auer von Welsbach, as the inventor's name should be written, may be matter of opinion; but our electrical contemporaries appear to have "felt that way," or they would never have cried out so loudly, and descended to "calling names." If the hasty report of M. Gréhant is the only weapon the electricians can command for attacking the incandescent gas-burner, they are in a bad way. It is noteworthy that among the sillinesses of which our electrical friends affect to think the heads of the gas industry capable, is that of dislike of the incandescent gas-burner. Consequently, they must regard us as very magnanimous in defending its character. At any rate, according to a view they are fond of expressing, this appliance for burning gas economically must be as much a "thorn in the side" of gas companies—if an impersonal corporation really has a side for a thorn to stick into—as they confess it is to electric lighting companies in the City of London and elsewhere. Therefore they cannot accuse us of having any selfish interest to subserve in championing the cause of incandescent gas lighting on sanitary grounds. But if, when accusing gas companies of acting upon the principle of favouring extravagant gas-burners, our electrical friends have unconsciously fallen into the very common weakness of judging other people's motives by their own, what a lurid light is thus thrown upon the practice of the electric lighting trade! However, we have no desire to labour this point. The incandescent gas-burner will go, after all, upon its merits, and according to the commercial aptitude of its proprietors; and the efforts of those who would prejudice the public mind against it upon grounds that can be demonstrated to be false, will recoil upon the perpetrators. In any case, the best advertisement the electrical press can give the burner is to vilify it.

The Lesson of Pullman.

One of the documents that every student of industrial economics may be recommended to procure and study is the report of the Commission of Inquiry instituted by the United States Government for the purpose of eliciting the truth about the great Pullman strike, which began with a spark of discontent, and ended in a conflagration that was only to be quenched by blood. The true story of this strike is but now ascertainable; and the disappointing reflection arises respecting it that the "popular" newspapers which did so much to aggravate the dispute at the time, by taking the strikers' side in everything, will never publish it. The world was told that the Pullman workpeople were struggling to emancipate themselves from the tyranny of a grinding plutocracy, and that the future of every wage-earner throughout the Union was bound up with their action. The consequence was that the Pullman operatives were supported by all the strength of the organized labour of the region round about, and by every Socialist in the States. If the President of the United States had not proved equal to the emergency, there is no saying what might not have happened. And all this trouble arose in connection with an employment that stood as high as any in the world for humanity, liberality, and fair management. For years the industrial town of Pullman was a parable and an example. Regular, well-paid work was found in it for 4500 hands, who were provided at little more than cost price with all the creature comforts of life. This was about the average number of workers in the Pullman factory during 1893; and the average of their earnings, taking men, women, and children together, was £123 for the year. At the middle of the year these workpeople had also an average of £48 to their credit in the savings bank. Then trouble began in the shape of a financial crisis, and work became scarce all over the country. Pullman suffered like other places. The management could not obtain orders enough to keep all hands employed, even at a loss. Consequently, men had to be discharged, and the wages of those retained reduced; leaving the average earnings still about 8s. to 10s. per day. Discontent arose, not unnaturally; but all might have gone well if agitators from outside had not got hold of the malcontents, and fanned dissatisfaction into riotous revolt. Now it is all over, and Pullman is at work again; but neither trade nor pay is up to the old standard—a state of things which must continue until commercial prosperity revives. What has been learnt at Pullman is the same lesson that has just been taught in the mining districts of Scotland. It is simply that the producers of commodities cannot control the markets. Not all the Independent Labour Parties in the world can alter this fact; and the sooner real workers learn the truth, and send about their business the windbag agitators who urge the contrary, the better for themselves and the community.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 836.)

Business in general in the Stock Markets was so quiet during the past week that there was no scope for any very pronounced tendency to make its mark. More Jewish holidays diminished the attendance for part of the time; while another part was more devoted to attending to the settlement than opening new business. However, notwithstanding the quietude, there was a more cheerful disposition distinctly perceptible; and a recovery from the extreme uneasiness produced by the apparently rapid approach of the Tsar's decease. Prices, therefore, on the whole compare favourable with the figures for the preceding week. The Money Market remains in the position it has occupied for many weeks past; and there is nothing ahead to point to a change. The Gas Market was not quite so active as it had recently been, but was still very firm. There were not so many changes made in quotations; but a few important issues effected a material advance. Gaslight "A" was moderately active at about middle figures, without showing any disposition to improve at all upon them. The debenture, preference, and limited issues, however, showed no abatement in their activity and strength; and three of them advanced their quotations liberally. Hardly anything to speak of was done in South Metropolitans; but the "B," after one or two transactions at good prices, had a fair rise. An unusual amount was done in Commercial old, which repeatedly changed hands at the top price; but the quotation was left where it was. The Suburban and Provincial Companies were more dealt in than usual—easily maintaining their recently advanced values; while Brentford old made a further improvement. The Continentals were steady and unchanged. One or two of the South American division relapsed, owing to special circumstances; but, beyond this, there was no movement to record. Very little was done with the Water Companies; the demand for debenture stock being the most conspicuous feature. But all were very firm; and a few advanced their quotations.

The daily operations were: The Gas Market did not display much activity at the opening; but prices of everything dealt in were very firm. Brentford old advanced 1; and Gaslight 6 per cent. debenture, 3. There was more doing on Tuesday; and the general tendency was in the same direction. Gaslight "B" made a big jump of 5½. On Wednesday, business in Gas was much about the same—if anything, a little quieter. Brentford old made a further improvement of 2; but Buenos Ayres fell ¼. There was more activity on Thursday, especially in Gaslights; but the only move was a rise of 3 in "J." Lambeth Water rose 1. Business fell off considerably on Friday, though prices did not suffer. South Metropolitan "B" rose 2½. New River debenture went up 2. Saturday was quiet as usual. Bahia fell 1. Southwark "D" rose 5.

ELECTRIC LIGHTING MEMORANDA.

Additional Capital for the Westminster Electric Supply Corporation—An Electric Supply Company's Assessment Appeal—A Mysterious Paragraph.

The Westminster Electric Supply Corporation is one of those fortunately-situated undertakings which can be truly described as still "going strong." An extraordinary general meeting of the Company was held last Wednesday, to consider a resolution for increasing the capital by £100,000; this course being advisable, in the opinion of the Directors, with a view to providing for the demands of a rapidly growing business. The Chairman explained to the meeting that it was not intended to apply the extra capital in erecting new buildings or extending the area of supply, but that it would be expended in the purchase of distributing plant—such as meters, cables, &c.—to meet the demand

of the existing district. In support of this statement, it was reported that, whereas at the end of last year the lamps on circuit, reduced to the standard of 8-candle power, numbered 131,565, the number has now reached 158,000, and about 9000 more are waiting to be connected. There is a fine roundness about these latter figures; but they are doubtless substantially accurate, and abundantly justify our description of the Company's condition and immediate prospects. If the electric lighting industry can do good business anywhere in the world, it must surely be in the region occupied by this particular Company and its nearest neighbours. The Chairman exercised a wise discretion in assuring the proprietors that the additional capital is not to be spent upon extensions of the stations or the district; for these are the things that make the sound of an open capital account to be dreaded by investors. An open capital account which is kept open for the purposes intended in this case is, on the contrary, a highly satisfactory feature, and places the electric lighting company requiring it upon an equal footing in this respect with the most prosperous gas company. What we particularly wish to draw the attention of our readers to in this connection is the simplicity of the procedure by which the electric lighting company increased their capital. It is only necessary for an extraordinary general meeting to be called and a resolution adopted, and the thing is done. How gas capital is treated we all know; and it certainly does not appear that the electric lighting interest has any reason for envying gas companies in this regard.

In another column will be found a report of the proceedings in the first recorded appeal of an electric supply company against an assessment, which was heard at the Birmingham Quarter Sessions on Monday of last week. The circumstances are nowise peculiar. In the first place, the Overseers guessed at a figure to represent the rateable value of the young undertaking; the following year they doubled it; and next time they put it up another 50 per cent. This line of action was simple; but it could not be regarded as inspired by even so much, or so little, science as usually goes to temper the play of imagination of a rating expert. The Company therefore thought it high time they went into Court to have a definition of their position. Very prudently, the appellants retained the services of Mr. T. Newbigging, whose experience in the cognate matter of gas-works rating might be trusted to throw light upon the special points arising in the valuation of electric light works, and of Mr. R. E. B. Crompton, who could be relied upon to instruct the Court upon the details of central station equipment. Mr. Newbigging succeeded in getting out a systematic valuation, which was so far satisfactory; but, unfortunately for the general interest of the record, the parties did not fight out the case—coming instead to a settlement, the terms of which were not disclosed. This may have been wisdom; but it does not help the world to a better understanding of the rights of central station assessment.

A somewhat mysterious editorial paragraph recently appeared in the *Electrician*, in which the requirements of the "average man" in the matter of electric light are defined and set against a number of considerations upon which electrical engineers are supposed to place exaggerated value. We are told in this lucubration, which does not appear on the surface to be *à propos* of anything in particular, that the average user of electric light does not care how "the current comes to his lamps"—surely, a loose expression this!—so long as he gets it. "So long as his filaments steadily glow"—this line has quite a poetical ring about it—they may be traversed, for all he knows, by "true sine curves, battered tall hat curves, or blunted saw-tooth curves." Neither is he curious respecting the merits of alternators, or boilers, or insulation methods. All he wants is his light; and the interesting hint conveyed through the medium of these sufficiently trite observations appears to be that he does not always get it. At any rate, it seems to be regarded by the electrical press as worth while to emphasize in this way "the elementary fact that the whole duty of an electric supply station is to give its customers, day after day, year in and year out, all the current they desire at the pressure their lamps require." It might be thought that this responsibility is sufficiently obvious. Our contemporary, however, goes on to admit that "the difficulties of providing a continuous supply of electrical energy at a constant pressure are, owing to the lack of storeage capacity, far greater than is the case where gas is concerned." When the obligation to afford this supply has been undertaken, however, it must be carried out; "and, as a measure of this fulfilment, it is sheer waste of arithmetical brain power to express the few odd moments during which the light is out as a percentage of the time it is not out." Has any electric lighting company been committing itself to such a method of excusing the shortcomings of the service? Because, if so, we should like to see such an interesting statement. Our contemporary meanwhile concludes its remarks on this head with the obscure sentence that "an impression which has gained strength of late, that central stations are principally intended to illustrate the glorious uncertainty of all things human was thought to need a decisive negative." What does it all mean?

Mr. J. H. Silcox, Manager of the Pembroke Gas-Works, has been returned for the third time as a member of the Pembroke Town Council—on this occasion without opposition.

WATER ACTS FOR 1894.

In the JOURNAL last week, we commenced our usual review of the water legislation of the past session, and complete to-day our notice of the various measures.

The Alloa Water (Amendment) Act is, as the name implies, to amend an Act of 1891 whereby the Commissioners of Police of the Burgh of Alloa were authorized to provide an additional water supply, including the construction of a waste weir at their Gartmore dam, so that the top water-level thereof should not be higher than 15 inches above the existing top water-level of the dam. An error of calculation having been discovered, in consequence of which the height of this level has been erroneously taken to be 166 instead of 167 feet above Ordnance datum, and this discovery having caused doubts to arise as to the power of the Commissioners to raise the top water-level as intended by the previous Act, the present Act authorizes this to be done; thus raising the level to a height of 168 ft. 3 in. above Ordnance datum. The Bacup Corporation Water Act empowers the Corporation to acquire the undertaking of the Rossendale Water-Works Company, which was incorporated in 1853. The capital of the Company is £29,000, of which a sum of £26,876 is paid up, and there is a mortgage debt of £6870. According to the terms of the agreement, which is scheduled, the undertaking is to be transferred in consideration of the issue to the shareholders of 5 per cent. annuities, redeemable after 1954 at 30 years' purchase. The Corporation take over the mortgage debt, and pay to the Company £82; being the total amount paid up on 22 forfeited shares. On the completion of the purchase, the Company are to hand over to the Corporation the balance of their unexpended capital, amounting to £443, after deducting the value of the unused stores and meters on hire. The Corporation pay the costs of the Company in respect of the agreement, and of the Wharncliffe meeting; as well as £50 towards the expense incurred in watching the Corporation Bill, and also the costs of preparing the abstract of title, and all other similar charges. The Act authorizes the Corporation to borrow the money required for paying off the mortgage debt, and £7000 for additional water-works purposes. The term "annual rack-rent or value" in the Act of 1853 is defined to mean the gross estimated rental as ascertained by the valuation list, or by the list made for the relief of the poor, subject to certain limitations. It is provided, for the protection of the Corporation of Rawtenstall, that an adequate supply of water is to be afforded within seven years to that portion of the borough which is included in the area of supply limited by the Act, under a penalty for default of £40 per week. The charge to the Corporation for water required for sanitary purposes is to be at the rate of 6d. per 1000 gallons. The Corporation may purchase at any time the portion of the undertaking situated within their district. Money borrowed under the Act is to be repaid in 50 years. Any surplus water revenue is to be applied in reduction of the domestic rate.

The Bury Corporation Act authorizes the Corporation to purchase compulsorily, for the purposes of their water undertaking, a piece of land situate in the township of Higher Booths, in the parish of Whalley, Lancashire; and also to acquire by agreement other lands not exceeding in extent 10 acres. The period of time fixed by an Act of 1889 for affording a sufficient supply of water to the inhabitants of the Haslingden district is extended by two years. The Cardiff Corporation Act authorizes the Corporation to raise £350,000 for water-works purposes, to include a sum of £132,904 already expended in excess of the former statutory powers. The enlargement of a reservoir authorized in 1884 to be constructed in the valley of the River Taff Fawr is sanctioned, for the purpose of impounding the waters of this stream and its tributaries, subject to the provisions as to compensation water secured by the same Act. The construction of a railway is authorized for the conveyance of materials required in connection with the water-works, and not otherwise. The Dundee Corporation Act abolishes the separate meetings of the Water Commissioners, and directs their business to be transacted at meetings of the Town Council and its Committees, provided that all the Water Commissioners are called to all such meetings at which water business is to be transacted, and also that the annual general meetings of the Commissioners are convened and held as heretofore, as required by the Water Acts. All water debenture stock is henceforward to be issued redeemable at par, after such period, being not less than 20 nor more than 60 years from the first issue, as may be declared at the time. The office of Clerk to the Water Commissioners is abolished, and the duties transferred to the Town Clerk.

The Fulwood Local Board (Water) Act empowers the Local Board to construct additional water-works comprising a reservoir to be known as the Barnsfold No. 2 reservoir, and situated in the township of Goosnargh-with-Newsham, Lancashire, which is to have a water area of 9½ acres or thereabouts. Land for the purpose is to be acquired within three years, and the works completed within seven years. Power is given for the laying of water-mains in undedicated roads, and for the supply of water by meter by agreement. The sum of £10,000, in addition to the taxed costs of the Act, is to be borrowed for water-works purposes, repayable in 50 years. Surplus water revenue is to be carried to the credit of the district fund. The Gloucester Corporation Act authorizes the construction of additional water-works by the Corporation, including a well and pumping-station,

with tunnels or drift-ways, in the parish of Oxenhall, and a reservoir in the parish of Newent, with the necessary pipe-lines, to be completed within ten years. Provisions are inserted for the protection of the Great Western Railway and the Severn Navigation. The Corporation may supply water in bulk or otherwise to any local authority, company, or person whose district or premises is situate within 1 mile of the lines of pipes authorized by the Act, on such terms and for such periods (not exceeding three years) as may be agreed upon. Water may be supplied within the Corporation limits by meter for domestic or other purposes. An agreement between the Newent Local Authority and the Corporation, for the supply of water to the former, is scheduled and confirmed. Provisions are inserted with regard to the construction of a bridge by which the water-mains are intended to be carried across the western branch of the River Severn at Over. The sum of £45,000 is to be borrowed for water-works purposes, upon security as regards one-half of the general district fund or rate and the water revenue, and for the other half upon the city fund or rate, to be repaid within 50 years. The costs of the Act are to be repaid in five years. The Corporation may, if they think fit, grant a gratuity of any sum not exceeding one year's pay to any officer or servant who may be disabled or injured in their service, or who may become incapacitated through age or infirmity; or, in case of death, to the widow or family. This gratuity is to be paid out of the salary or wage fund out of which the beneficiary would have been paid if he had continued in his office or service.

The Kendal Corporation Gas and Water Act authorizes the transfer of the undertaking of the Kendal Union Gas and Water Company to the Corporation of Kendal, in accordance with the terms of a scheduled agreement. The sum of £31,557 is, for the purposes of the Corporation, stated as the price of the water portion of the undertaking. Additional water-works are to be constructed, comprising a reservoir, to be called the Fisher Tarn reservoir, to be formed by means of a dam across the upper waters of the Beehive Beck, with the necessary subsidiary works. Compensation water at the rate of 60,000 gallons is to be discharged daily down the stream named, under penalty for default of £5 a day. The works are to be completed within seven years, subject to clauses for the protection of certain landowners and the Corporation of Manchester. Rates for domestic supply range from 8 to 6 per cent., with extras; or water may be supplied by measure. Besides the money required for the purchase of the undertaking, the Corporation are authorized to borrow £28,800 for water-works purposes, to be repaid in 50 years. Surplus water revenue is to be carried to the district fund. The Neath Corporation Water Act authorizes the Corporation to acquire the undertaking of the Neath Water Company. The Company were incorporated in 1861, and have a paid-up capital of £29,720, with £8964 in debenture stock and bonds. According to the terms of the scheduled agreement, the Corporation pay to the Company in cash £30,070, and the value of the loose stock and plant. The total consideration for the transfer is stated at £46,034. The Corporation take over the mortgage debt of the Company, part of which is irredeemable. An agreement with a landowner for the lease of certain lands is also scheduled and confirmed by the Act. Additional works are to be constructed, comprising a reservoir to be formed by an embankment thrown across a dingle in Moss House Wood, with the object of impounding a stream flowing down it. Certain water rights belonging to the Great Western Railway Company are safeguarded. The construction of reservoirs authorized by the Neath Water-Works Act, 1885, is abandoned, and the deposit released. Besides the money required for the purchase of the undertaking, the Corporation are empowered to borrow £25,000 for water-works purposes and for payment of the costs of the Act. On and after the transfer, the term "annual value" in the Act of 1861 is to mean the gross estimated rental. Notwithstanding anything in the Company's Acts, the Corporation may charge an excess water-rate of 15 per cent. for supplies furnished outside the borough. Surplus water revenue is to be applied to reduce the price of water; and any deficiency of revenue is to be made good by the levy of a special rate. The Skewen portion of the undertaking is to be acquired by the Guardians of the Neath Poor Law Union, acting as the Neath Rural Sanitary Authority. Power is given to the Briton Ferry Local Board to purchase their portion of the undertaking within six months after the passing of the Act.

The Pontypridd Water-Works (Tramroad) Act empowers the Company to construct an unfenced tramway a little more than 2 miles 3 furlongs in length from Maerdy to a site upon the Rhondda Fach River, where a reservoir embankment is now to be made, with the object of facilitating the latter work, but not for passenger traffic. The sum of £6000 may be applied to this purpose; a corresponding amount being added to the capital which the Company were authorized in 1892 to expend upon their water-works. The Swindon Water Act authorizes the Local Boards for the districts of Old Swindon and Swindon New Town, in Wiltshire, to acquire the undertaking of the Swindon Water-Works Company, Limited. The capital of the Company is £45,000, all in £1 shares, fully paid up, and debenture stock to the amount of £12,000 has been issued. A Water Board is to be formed for taking over the concern on behalf of the two Local Boards—the consideration for the transfer set out in the scheduled agreement being the issue of annuities at the rate of £1 for every £10 of capital; the mortgage debt to be paid off by the Local Boards. Additional works are to be constructed, including a storeage reservoir in the parish of Wroughton, to be completed within ten years. Provisions are inserted for safeguarding the water rights of the Highworth and Swindon Rural Sanitary Authority, and the Wilts and Berks Canal Company. Rates for domestic supply range from 8½ to 6½ per cent., with extras graduated in accordance with rental. Water may be supplied by measure. The surplus water revenue is to divided between the Local Boards in the proportion of the assessable value for the time being of their respective districts, or may be applied in reduction of water rates. The Swinton Local Board Act empowers the Local Board to improve their existing water supply by the construction of a well and pumping station to be situated in the township of Swinton, in the parish of Wath-upon-Dearne, in the West Riding, and other works, to be completed within seven years. Water may be supplied by meter, or at a rate of 7 per cent. The sum of £10,000 is to be raised for water-works purposes, repayable in 60 years. The Wakefield Corporation Water Act confers powers upon the Corporation for the construction of certain filter-beds and a service reservoir, together with a number of pipe-lines, in the townships of East Ardsley and Alverthorpe-with-Thornes. The authorized reservoir is to be in substitution of a reservoir authorized by an Act of 1880, and never begun. When and so soon as the new reservoir is finished and put into use, the Corporation are to be bound to give a constant supply from it to the West Riding Pauper Lunatic Asylum. The works are to be completed within seven years. Additional water capital to the amount of £70,000 is to be raised, with more if required and sanctioned by the Local Government Board, to be repaid in 50 years. A clause provides that the costs of obtaining the Act shall be defrayed in the first place out of the district fund and general district rate, but ultimately out of money borrowed under the Act.

A Correction.—In our account last week of the proceedings in connection with the inauguration of the new gasholder for the Bristol Gas Company at Barton Hill, it should have been stated that the toast of "The Contractors" was responded to for Messrs. C. and W. Walker, the builders of the holder, by Mr. Alfred Featherstone, their General Manager, not by Mr. W. B. Featherstone as stated.

Mr. George Livesey on the Municipalization of the London Gas Supply.—We learn that the "*Liberty Review* Annual" for 1895 (17, Johnson's Court, Fleet Street), which will be published on the 26th prox., in addition to interesting articles by Mr. Frederick Greenwood, Lord Stanley of Alderley, and Canon Hayman, will contain an important contribution by Mr. G. Livesey on the question: "Should the London Gas Supply be Municipalized?"

The Alleged Vitiation of the Atmosphere by Incandescent Gas-Burners.—We remarked last week on the assertions made by the *Electrical Review* as to the alleged vitiation of the atmosphere of rooms lighted by incandescent gas-burners. A correspondent points out that the experiments on which the statements were made showed the presence of a proportion of 1 : 4500 of carbon monoxide in the combustion products of the burner; whereas our contemporary made out that this was the proportion in the atmosphere of a room—an altogether different matter.

The London County Council and the Metropolitan Water Supply.—At the meeting of the London County Council to-day, a report will be presented from the Water Committee in which they say: "In view of the inquiries which we are now making as to available sources of water supply for London, it is essential that we should have reliable information respecting certain large reservoirs in connection with a scheme now being considered." The Committee accordingly ask for authority to have the surveys made, the cost not to exceed £450—a sum which includes £200 "for one year's salary of the person to be employed," the remainder of the money being required "for necessary expenses." A report will also be presented from the Public Control Committee, stating that the East London Company have been "cutting off" the supply in their district "nightly and, in some parts of the district at intervals during the day, thereby causing great inconvenience to the consumers and danger to their health, as well as seriously increasing the risk to life and property in the event of fire." The Company, in a statement addressed to the Council, have pleaded the deficient rainfall, following on the drought of last year, and have quoted an extract from the recently issued report of General Scott, to the effect that the diminution in the flow of the River Lea "had rendered it prudent to husband the Company's visible supply of water." In the face of all the facts—parliamentary, physical, and official—showing that the Company have been doing their best, the Committee recommend as follows: "That the Solicitor be instructed to take proceedings against the East London Water-Works Company for failure to maintain in its district a constant supply as required by the provisions of the Metropolis Water Act, 1871." The circumstance that the introduction of the constant supply was a voluntary act on the part of the Company is not considered to lessen their liability; Counsel having "advised" to this effect.

COMMUNICATED ARTICLES.

NOTES ON HERR NIEMANN'S PAPER ON THE STRAINS IN GASHOLDER GUIDE-FRAMING.*

By F. S. Cripps, Assoc.M.Inst C.E.

1.—Introduction.

The translation of the valuable paper by Herr Niemann is worthy of the closest attention of gas engineers.

The paper may be described as an attempt to elucidate the strains on the guide-framing of gasholders, by taking an elementary frame, analogous in form, and determining expressions for the strains on its various parts under certain assumed conditions. The frame selected resembles the guide-framing of a single-lift gasholder, having a pair of diagonal ties in each bay. One cannot help regretting that the able author did not take an actual example of complex character and work the strains throughout in detail. A gasholder like Mr. Livesey's at East Greenwich (300 feet in diameter, with six lifts enclosed in a cobweb of framing) would have afforded ample scope for testing the utility of the treatment, and would have been more "up to date."

2.—Outline of Herr Niemann's Method.

The method adopted is that of supposing the whole guide-framing to be hinged at the base, and to have yielded under wind pressure, so as to lean regularly forward from the perpendicular, and in such a way that the sides of the several bays (or parallelograms formed by the columns, girders, and base) shall not alter in length during displacement. But, on the other hand, the diagonal ties in each bay are treated as perfectly *elastic*, so that they accommodate themselves in length to the displacement of the several bays. Then, the relative *extensions* of the diagonals of the various bays are taken as proportionate to the strains acting upon them. This forms the foundation of the whole system. The strain on the ties is first determined; and then, by working backwards, so to speak, the strain on the columns, girders, and carriages is deduced therefrom.

3.—Objections to the Method.

(*a*) An objection may be raised as to why the diagonal ties alone are credited with elasticity. May not the whole of the members—curbs, cups, carriages, girders, and columns—as well as ties, be elastic? If so, would not this affect the strains on the ties accordingly, and consequently the regular displacement?

(*b*) No notice is taken of the assistance rendered by the columns in resisting transverse strains. The columns are not "hinged" in practice, but rigidly "fixed" top and bottom; and hence they may relieve the ties of much strain. Many telescopic gasholders have ties much too slender to render any practical service; hence they would snap, and the gasholder become a ruin, unless the other parts of the framing did more work than Herr Niemann credits them with.

(*c*) Very few single-lift gasholders have any diagonal ties; therefore the above method could not apply to such cases, inasmuch as everything in Herr Niemann's calculations is deduced from the strain on the ties.

(*d*) The formulæ laid down by Herr Niemann only apply to single-lift gasholders of the simplest construction. They would need considerable expansion and modification to make them applicable to telescopic gasholders of even the most ordinary character.

4.—Summary of Herr Niemann's Results.

The practical results of Herr Niemann's investigations are summed up by formulæ Nos. 8, 19, 20, 21, and 24. These give the *maximum* strains on the various parts of the guide-framing, under the conditions and treatment adopted; but they may be expressed in very much simpler form without materially altering their value, as the following will show.†

Simplification of Formulæ.

Taking the formulæ in the order mentioned, we have—

Formula 8.—To find the maximum strain on the most severely strained diagonal.

$$\text{"}\frac{W}{2\cos\phi\,[\sin^2 {}^1/_2\,a + \sin^2 {}^3/_2\,a + \ldots \sin^2 (n-{}^1/_2)\,a + \ldots]} = Z\text{"}$$

For this may be substituted the exceedingly simple formula—

$$Z = \frac{D\,d\,l}{100\,n\,s} = \text{strain in } \textit{tons}. \qquad \text{I.}$$

Where D = diameter of holder in feet.
d = depth " "
l = length of a diagonal "
n = number of columns.
s = clear space *between* two columns in feet.

Notes.—The wind pressure per square foot is taken at 32 lbs. This is increased to 40 lbs., to allow for elasticity of the whole framing, &c. The effective pressure to allow for the rounded form of the holder is 56 per cent. of that on the whole diametrical section. Half of the total so found is considered as acting through the top rollers. The formula is based upon the general formula $\frac{2\,W}{n\cos\phi}$ The $\cos\phi$ is practically $\frac{s}{l}$

For notation used in formulæ taken from Herr Niemann's paper, reference must be made thereto. (See *ante*, p. 778.)

Formula 19.—To find the maximum pressure on the most compressed column.

"$Z\sin\phi = V$" may be more correctly expressed by $Z\sin\phi + E$; but, to make it more useful, we have—

$$Z \times \frac{h}{l} + E = V \qquad \text{II.}$$

Or, filling in the value of Z, we have—

$$\frac{D\,d\,h}{100\,n\,s} + E = V. \qquad \text{III.}$$

Where E = the weight of one column, girder, and tie—*i.e.*, one complete bay—in *tons*, and
h = the vertical height of the diagonal tie. This is about equal to d (feet).

Notes.—E must be added to give the *total* pressure or compression on the column.

$\frac{h}{l}$ = the sin ϕ approximately.

Other notation as under previous paragraph (formula 8).

Formula 20.—To find the maximum tension on the most severely strained girder.

$$\text{"}Z\cos\phi\,[\sin {}^1/_2\,a + \sin {}^3/_2\,a + \sin {}^5/_2\,a + \ldots \sin(n-{}^3/_2)\,a + \sin(n-{}^1/_2)\,a]\} = T\text{"}$$

may be expressed as follows:—

$$T = Z\frac{D}{l} \qquad \text{IV.}$$

Or, filling in the value of Z, we have—

$$\frac{D^2 d}{100\,n\,s} = T. \qquad \text{V.}$$

Notes.—General formula $= Z\cos\phi\frac{1}{\sin {}^1/_2\,a} = Z\frac{s}{l}\times\frac{1}{\frac{s}{2}\times\frac{2}{D}}$

$= Z\frac{s\times D}{l\times s}$ or $Z\frac{D}{l}$, as given above. The $\sin {}^1/_2\,a$ is approximately equal to half the space s divided by half the diameter of the holder, or $\frac{s}{D}$.

Formula 21.—To find the maximum thrust of the top roller against the column guide.

$$\text{"}2\,Z\cos\phi\sin {}^1/_2\,a\,[\sin {}^1/_2\,a + \sin {}^3/_2\,a + \ldots \sin(n-{}^3/_2)a + \sin(n-{}^1/_2)\,a]\} = P\text{"}$$

may be written—

$$2\,Z\frac{s}{l} = P. \qquad \text{VI.}$$

Or, inserting the value of Z, we have—

$$\frac{D\,d}{50\,n} = P. \qquad \text{VII.}$$

Notes.—The part of formula 21 in brackets $= \frac{1}{\sin {}^1/_2\,a}$ which multiplied by the $\sin {}^1/_2\,a$ cancels out; leaving $2\,Z\cos\phi$ as above, where $\frac{s}{l} = \cos\phi$ as before.

Formula 24.—To find the maximum tension on the foundation bolts.

"$Z\sin\phi - E = A$" may be expressed—

$$Z\frac{h}{l} - E = A. \qquad \text{VIII.}$$

Or, filling in the value of Z, we have—

$$\frac{D\,d\,h}{100\,n\,s} - E = A. \qquad \text{IX.}$$

Notes.—This gives the total tension on all the bolts holding down one column, not each bolt.

5.—Example Showing Application of Formulæ.

An example will not only make the above formulæ perfectly clear, but will also show their extreme simplicity:—

Gasholder 110 feet in diameter, and 30 feet deep (single lift), with guide-framing consisting of 12 columns or standards, having one top tier of girders and single diagonal bracing—

Length of tie. . . . = (say) 43 feet (l)
Height of tie. . . . = " 32 " (h)
Space between columns = " 28 " (s)
Weight of column, &c. = " 3 tons (E)

To find the *tension on the diagonal tie* (Z), applying formula I.

$$\frac{D\times d\times l}{100\times n\times s} = \frac{110\times 30\times 43}{100\times 12\times 28} = 4{\cdot}2 \textit{ tons}.$$

To find the *compression on the vertical columns* (V) by formula III.

$$\frac{D\times d\times h}{100\times n\times s} + E = \frac{110\times 30\times 32}{100\times 12\times 28} + 3 = 6{\cdot}1 \textit{ tons}.$$

To find the *tension on the girders* (T) by formula V.

$$\frac{D^2\times d}{100\times n\times s} = \frac{110\times 110\times 30}{100\times 12\times 28} = 10{\cdot}8 \textit{ tons}.$$

* These are the notes referred to in the remarks preceding the translation of Herr Niemann's paper which appeared in the JOURNAL last week (p. 778).—Ed. J. G. L.

† It is useless, for practical purposes, to consider any but the "*maximum*" strains, because all lesser strains are necessarily included in the maximum.

To find the *thrust against the column guide* (P) by formula VII.

$$\frac{D \times d}{50 \times n} = \frac{110 \times 30}{50 \times 12} = 5{\cdot}5 \text{ tons.}$$

To find the *tension on the foundation bolts* (A) by formula IX.

$$\frac{D \times d \times h}{100 \times n \times s} - E = \frac{110 \times 30 \times 32}{100 \times 12 \times 28} - 3 = 0{\cdot}1 \text{ ton.}$$

I am not prepared to admit that these are the *actual* strains on the framing; but they are the logical outcome of Herr Niemann's paper. Still less should I recommend a gasholder to be built of such scantlings as only to resist these strains. There are other important practical considerations which seriously modify any merely theoretical apportionment of the metal.

6.—Important Considerations.

In considering papers of this kind, it is always well to bear in mind that an exact mathematical determination of the strains on the guide-framing of a gasholder is an absolute impossibility, owing chiefly to the fact that the disturbing influences which occur in actual practice are apt to explode, or, at any rate, to seriously modify, the data or theoretical assumptions upon which the whole of the calculations are based. By "theoretical assumptions" is not meant simply the variable intensity of the wind pressure per square foot (this cannot disturb the accuracy of the *method*), but the manner in which the force of wind pressure is delivered up or transmitted by the bell, or floating holder, to the framing. Some top rollers are of necessity off the guides altogether (due principally to contraction of the top curb under strain). Hence the intensity of the external forces or pressures, as well as their directions, may vary considerably, in actual practice, from any preconceived arrangement or distribution of them.

Assumptions such as the proportionate displacement of the parts according to their position; the hinging of all the joints in the frame, to the neglect of fixed or bracketed ends; the uniform resistance of the bell itself to deformation (the curbs being supposed incapable of distortion); and the effect of temperature and elasticity, are all very doubtful factors in the problem, although exercising considerable influence over the results. These uncertain disturbing influences are such as to make any abstruse mathematical treatment of the subject of very doubtful utility. In fact, such treatment is liable to lead some astray; for, as Sir Benjamin Baker so very aptly remarks in his incomparable little treatise on the strength of beams and arches:* "In engineering, lengthy infinitesimal calculations not only involve unjustifiable waste of time, but have the great contingent disadvantage of checking the growth of sound judgment in the engineer, by giving a fictitious appearance of accuracy to results which are not susceptible of exact deduction."

7.—Conclusion.

Herr Niemann's paper, however, although it is somewhat formidable at first sight, is not so in actual fact. The graceful and easy manner in which the author glides from one step to another throughout his investigations, is pleasing, and helpful to the understanding of the subject. We have seen that his results may be much condensed, and expressed in simple and handy form. Unfortunately, these results scarcely apply to modern complex structures as erected in England; and therefore they are not very valuable in practical work. But, on the other hand, the treatment of the subject generally is so excellent that the paper will well repay most careful study by the engineer.

27, *Great George Street, Westminster, July* 30, 1894.

* "On the Strengths of Beams, Columns, and Arches." By B. Baker. (London: E. and F. N. Spon; 1870.)

UNACCOUNTED-FOR GAS.

By Lewis T. Wright.

I believe it will not be incorrect to say that the study of the item of unaccounted-for gas has been somewhat neglected; and, further, that the mode employed in gas statistics of stating it as a percentage of the gas produced often veils much important information. The item of unaccounted-for gas contains the net result of all differences between the volume of gas that comes into the accounts as sold, &c., and the volume produced as measured by the station meters. That it consists mainly of gas lost by leakage there can be no doubt, or that this leakage is due to imperfections in the distribution system.

On investigation, it will be discovered that many gas undertakings with a low percentage of gas not accounted for have often, relatively to the extent of their distribution systems, a considerable loss of gas; and *vice versâ* many undertakings that appear to have a large leakage will not be found to be losing a very large quantity of gas per mile of main. It will be further discovered that a dense gas consumption and large output per mile of main sometimes conceal a considerable loss of gas.

In the following table (A) will be found (1) the percentage loss and (2) the loss per mile of main per annum of some of the well-known gas undertakings for the years 1885 and 1892.

It will be remarked that while in many cases the unaccounted-for gas appears to have diminished, yet if it be expressed as a loss per mile of main it has really increased. This increase is notable in the case of the Metropolitan Companies. Some years since, the writer proposed that this item should, for technical purposes, be stated as a loss per mile of main; or, better still, if it be possible, in order to allow for the size of mains and extension of service-pipes and the mean gas pressure employed, as a loss per 1000 superficial feet of main, &c., per 10-10ths of gas pressure per hour. In any case, it would be an important addition to gas statistics if the loss of gas per mile of main per annum were stated in company with the percentage loss.

Table A.

Company or Corporation.	1885. Annual Loss per Mile of Main. Thousands.	1885. Loss per Cent.	1892. Annual Loss per Mile of Main. Thousands.	1892. Loss per Cent.
Gaslight and Coke	507·7	5·34	512·8	4·78
Commercial	488·1	6·70	501·7	6·01
South Metropolitan	375·8	5·42	448·3	5·02
Brentford	218·8	6·77	196·7	4·48
Croydon	227·1	5·04	173·9	3·10
Crystal Palace	357·0	6·25	557·5	7·59
Mitcham	122·0	5·78	171·5	6·54
Richmond	302·2	6·03	405·3	5·87
Tottenham	174·1	4·81	200·4	5·14
Wandsworth	524·1	10·49	414·6	5·58
West Ham	271·9	8·09	144·6	4·77
Birmingham	439·6	6·58	493·9	6·32
Bolton	205·9	5·81	124·3	3·47
Leicester	177·2	2·44	144·9	1·68
Manchester	300·7	7·03	278·2	5·66
Salford	308·7	8·04	379·5	7·73
Bath	228·6	5·07	197·0	4·10
Brighton	376·5	6·37	428·4	5·95
Bristol	286·6	5·55	507·7	8·29
Derby	307·6	5·89	350·0	5·79
Liverpool	223·5	5·54	237·5	5·36
Newcastle	411·9	13·26	390·8	10·19
Plymouth	639·3	7·23	835·2	7·57
Portsea Island	155·2	4·10	158·5	3·80

The writer has found the loss of gas by leakage from gas-mains under tests within the limits of gas pressure usually employed in practice to be proportional to the pressure; that is to say, if the pressure be doubled, the loss is doubled. It would be necessary, therefore, in making very close comparisons between gas undertakings, to take into the reckoning the mean gas pressure that prevailed in the respective distribution systems. It is also very desirable to take into account the extension of the service-pipes, as these form a very vulnerable part of the distribution system. In a case investigated by the writer, where there had been a rise in the unaccounted-for gas per mile with no apparent increase in the mean pressure, it was found that there had been an addition to the number of service-pipes per mile of main.

It is the practice in some gas undertakings to correct the volume of the daily gas production in order to bring it to the standard conditions of 30 inches of the barometer and 60 degrees temperature, and then to make use of the corrected gas production for the purpose of arriving at the quantity of gas unaccounted for. It is of the highest importance to so correct the gas production, for, unless this be normalized for the daily variations of temperature and pressure, no intelligent control of the working of retort-houses would be possible.

The following table (B) will illustrate the operation of the correction for two years' production of a large gas undertaking:—

Table B.

Quarter Ending.	Mean Bar.	Mean Ther.	Mean Tabular Number.	Gas Made as Registered on Station Meters.	Gas Made, Corrected to 30' Bar. and 60° Fahr.	Differences.
	In.	Deg.		Thousands	Thousands.	Thousands.
June	29·85	58·3	0·9981	221,708	221,297	− 411
Sept.	29·98	64·8	0·9878	200,343	197,908	− 2,435
Dec.	29·88	57·0	1·0045	448,452	450,449	+ 1,997
March	29·89	52·4	1·0162	467,362	474,924	+ 7,562
			1·005	1,337,865	1,344,578	+ 6,713
June	29·93	56·0	1·0075	230,723	232,450	+ 1,727
Sept.	29·94	64·3	0·9867	201,257	198,578	− 2,677
Dec.	29·75	58·0	0·9967	467,002	465,483	− 1,519
March	30·10	53·0	1·0214	476,559	486,756	+ 10,197
			1·0056	1,375,541	1,383,267	+ 7,728

The correction as applied to the daily productions for a whole year is not very marked; being 5 and 5·6 per 1000 respectively. The difference between the corrected and the uncorrected volumes is, in the case of certain quarters, much more prominent than in others, especially in the March quarter, which is the coldest of the year.

It is in some cases the practice to deduct the gas sold (uncorrected) from the corrected gas production, and thus obtain the unaccounted-for gas. Other undertakings, however, and probably the most numerous, simply deduct the gas sold

(uncorrected) from the uncorrected gas production. There is an important difference between these two practices. Table C furnishes a case in point of eight quarters' (two years') gas made and sold.

It will be observed that the effect of comparing the uncorrected gas sold with the corrected gas produced is to increase the quantity unaccounted for nearly ½ per cent. beyond what it is if the uncorrected gas sold be compared with uncorrected gas produced, and also to increase the variations in the quarterly differences. Apart from differences of mean gas pressure, there is no reason why there should be differences in the total quantity of gas lost by leakage in the summer quarters over the winter quarters. In the case quoted above, great care had been observed, in the quarterly index takings, to make this operation (which has, of course, to be spread over several days) equal to the same result that would have happened could all the states of the consumers' meters have been taken on the quarter day. Thus, as far as it was possible, the periods covered by the states of the consumers' meters were coincident with the corresponding quarterly gas productions. It is to this precaution that the small differences between the various quarterly quantities of unaccounted-for gas is to be attributed. Before the system referred to had been adopted, the quarterly quantities of unaccounted-for gas differed very much among themselves. It will be noted that the effect of comparing the uncorrected volume of gas sold with the corrected volume of gas made is to make the quarterly quantities of gas unaccounted-for vary between 13,951,000 and 28,916,000 cubic feet. When the uncorrected gas production is taken as the basis, the differences range between 16,630,000 and 23,751,000 cubic feet.

The writer has endeavoured to obtain some information respecting the average temperature of the gas at the time of its measurement by the consumers' meters. It is almost impossible to obtain this by direct means; but it was hoped to arrive at it inferentially by measuring the quantity of water lost in the meters, which in the case investigated were wet ones. In order to make clear the method employed, it will be necessary to trace the history of the gas in its passage from the station meters, which were in meter-houses, to the consumers' meters.

The temperature of the gas in the station meters was, of course, known. This is affected by a variety of causes differing in different works. The gas is produced equally throughout the 24 hours of the day, but is mostly delivered from the gasholders at times when the temperature of the air is below the daily mean; and with the assistance of the Greenwich tables, it was found that, taking into account the varying quantities of gas delivered at different periods of the day, and, supposing the gas always to have the same temperature as the air, the result was as though all the gas had been supplied at a temperature 2·5° Fahr. less than the annual mean.

It does not in any way affect the system employed in this inquiry whether the gas in process of delivery from the gasholders had or had not the same temperature as the atmosphere for the time being. The gas, at whatever may be its temperature, deposits water immediately on entering the mains; and there can be no doubt it soon acquires the temperature of the earth in which the mains are laid. The gas probably brings much water into the mains in a state of mist. It is supersaturated with moisture. Further, most of the water found in the mains is that deposited in the vicinity of the works. The earth temperatures were carefully observed for various depths and localities. From such observations as have been published, it will be found that at about 2 feet depth the mean annual earth temperature is generally nearly 1·5° Fahr. higher than the mean annual air temperature; and it is known that at such a depth the diurnal variation is nominal—being but 0·1° Fahr.

It is assumed that when the gas had reached the service-pipes it had the same temperature as the earth in which the mains were buried; and, further, was normally saturated with aqueous vapour for this temperature. On leaving the gas-mains to pass through the service-pipes, there may be some lowering of the temperature of the gas. The amount of moisture deposited in consequence of this lowering of temperature is believed to be trifling; but, in any case, it must be neglected, as there are no means of measuring it.

On entering the houses, &c., where the consumers' meters are situated, and that are more or less artificially heated and protected from inclement weather, there is a raising of the temperature of the gas, which, if in its passage through the meters could normally saturate itself with aqueous vapour, would thereby give us the means of calculating the rise of temperature. The quantity of water so evaporated in the meters was observed for nearly 6000 meters, together with the quantity of gas which had passed through. A short summary of the results obtained is given in Table D. The figures in the column A give the average quantity of gas in cubic feet that had passed per "light" through the meters; and those in B show the loss of water in grains per cubic foot of gas passed.

TABLE C.

Quarter Ending.	Gas Made, Uncorrected.	Gas Sold, Uncorrected.	Difference (Unaccounted-for Gas).		Gas Made, Corrected.	Gas Sold, Uncorrected.	Difference (Unaccounted-for Gas).	
	Thousands.	Thousands.	Thousands.	Per Cent.	Thousands.	Thousands.	Thousands.	Per Cent.
June	221,708	203,544	18,164		221,297	203,544	17,753	
September	200,343	176,592	23,751		197,908	176,592	21,316	
December	448,452	430,391	18,061		450,449	430,391	20,058	
March	467,362	447,878	19,484		474,924	447,878	27,046	
	1,337,865	1,258,405	79,460	5·94	1,344,578	1,258,405	86,173	6·41
June	230,723	213,913	16,810		232,450	213,913	18,537	
September	201,257	184,627	16,630		198,578	184,627	13,951	
December	467,002	443,380	23,622		465,483	443,380	22,103	
March	476,559	457,840	18,719		486,756	457,840	28,916	
	1,375,541	1,299,760	75,781	5·51	1,383,267	1,299,760	83,507	6·04

TABLE D.

Quarter Ending.	2-Light Meters.		3-Light Meters.		5-Light Meters.		10-Light Meters.		20-Light Meters.		30-Light Meters.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
February	2109	1·53	2139	1·29	4276	0·81	4047	0·69	2780	0·92	2197	0·79
May	1328	1·90	1503	1·25	2837	0·80	2613	0·54	1924	1·01	1440	1·00
August	643	2·78	818	2·08	1647	1·18	1184	1·30	1111	1·75	714	1·19
November	1157	2·47	1339	1·49	2585	1·01	2139	0·93	1273	1·34	1112	1·15

A study of the results in Table D indicates that the quantity of water absorbed by the gas is affected by the velocity of the gas and the size of the meter; and as the smallest meter lost the largest quantity of water per cubic foot of gas, it would appear (as, indeed, the results indicate) that with the larger meters, especially those for more than three lights, the gas passed through too rapidly to become fully saturated with aqueous vapour. From the quantity of water lost by the 2-light meters, the calculated average temperature of the gas sold was 59·2° Fahr. —a result probably below the truth.

The mean annual earth temperature was	48·8° Fahr.
The same reduced to quarterly variations in the gas consumption	46·4° ,,
Quantity of water lost by 2-light meters per c. ft. of gas	2·01 grs.
Calculated temperature of the gas measured by the 2-light meters	59·2° Fahr.
Mean barometer	29·93 in.
(1) Gas made, uncorrected	1,375,541,000 c. ft.
(2) Do. corrected to 30' bar. and 60° Fahr.	1,383,267,000 ,,
(3) Gas sold, &c., uncorrected	1,299,760,000 ,,
(4) Do. corrected to 30' bar. and 60° Fahr. assumed to be at temperature indicated by the loss of water in 2-light meters	1,298,460,000 ,,
Unaccounted-for gas as a difference between 3 and 1	75,781,000 ,,
Or per cent.	5·51
Unaccounted-for gas as a difference between 3 and 2	83,507,000 ,,
Or per cent.	6·04
Unaccounted-for gas as a difference between 4 and 2	84,807,000 ,,
Or per cent.	6·16

It is probable, on other grounds, that the average temperature of the gas in the consumers' meters does not differ very much from 60° Fahr.; so that it is not very unsafe to compare the uncorrected gas sold with the gas production as corrected to this temperature. It will be understood that, if the station meters are in a very exposed situation, a considerable error would arise on comparing the uncorrected gas sold with the uncorrected gas made.

1, *Victoria Street, Westminster, S.W.*

The Directorate of the Georgetown (British Guiana) Gas Company, Limited.—The vacancy caused in the directorate of this Company by the death of the Chairman, Mr. Alfred Williams, has been filled by the appointment of Mr. H. W. Andrews.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Autumn General Meeting of this Association was held on Thursday last, at Birmingham; and, both in attendance and the quality of the technical business, it was a great success. The PRESIDENT (Mr. R. O. Paterson, of Cheltenham) occupied the chair.

The following ordinary business was first disposed of:—

MINUTES OF THE SPRING MEETING.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby), read the minutes of the proceedings at the meeting held at Cheltenham in May last; and they were approved.

NEW MEMBERS.

On the motion of the PRESIDENT, seconded by Mr. B. W. SMITH (Smethwick), the following gentlemen were elected members of the Association: Mr. Percy G. Winstanley, of Nuneaton; and Mr. Alfred Bird, of Bromsgrove.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said the next matter for consideration was the election of office-bearers. They had, as the members were aware, recently altered the constitution of the Association by putting a Vice-President upon the list of officers. Last year they nominated to that office Mr. G. Winstanley, of Coventry; and he was sure it would be the unanimous wish of the members that he should be elected President for the ensuing year. He (the President) was quite sure that they knew sufficient of Mr. Winstanley's work to justify them in hoping and believing that he would maintain the dignity, and advance the interest, of the Association.

Mr. SMITH seconded the motion, which was agreed to.

Mr. WINSTANLEY heartily thanked the members for placing him in the honourable office of President; and he assured them that whatever it was possible for him to do should be done to maintain the position of the Association.

Mr. J. S. CRANMER (Stratford-on-Avon) said he had much pleasure in proposing a gentleman for the vice-presidency; and he was sure that, when he mentioned the name recommended by the Committee, the members would agree with him that their choice was a most happy one. It was that of their old friend, Mr. W. R. Cooper, of Banbury.

Mr. P. SIMPSON (Rugby), in seconding the motion, reminded the members of the excellent services Mr. Cooper for some time rendered to the Association as Hon. Secretary, and said a more worthy man they could not confer honour upon.

The PRESIDENT cordially supported the motion; remarking that he was satisfied they would have in Mr. Cooper a very excellent worker. For a long series of years, they had all been hoping to see Mr. Cooper in the chair; but they had never prevailed upon him to come to office before. It was not the fault of the Committee; but somehow or other it seemed to be a difficult thing to get capable men to come out of their shells. It was a matter of gratification to the Committee that Mr. Cooper had now consented to stand for the dignified position of Vice-President.

The motion was heartily agreed to.

Mr. E. L. ADLINGTON (Worcester) proposed, and Mr. WILLIAM NORTH (Stourbridge) seconded, the re-election of Mr. Simpson as Honorary Treasurer; and this was carried.

Mr. COOPER appropriately acknowledged the honour conferred upon him by the members; and Mr. SIMPSON thanked them for their continued confidence in him.

Mr. WINSTANLEY moved the reappointment of the Hon. Secretary, who, he remarked, had faithfully fulfilled his duties during the time he had occupied that position.

Mr. J. S. REEVES (Bilston) seconded the motion, which was cordially passed.

Mr. MEIKLEJOHN thanked the members for their appreciation of his services, and said he should be pleased to continue them during the coming year.

Mr. W. T. TEW (Warwick) moved, and Mr. T. CROSS (Cannock) seconded, the election of Messrs. J. Young (Etruria) and Mr. J. Brookes (Derby) as members of the Committee for the ensuing year; and this was agreed to.

Messrs. W. Parlby (Hereford) and S. Meunier (Stockport) were afterwards selected for the office of Auditors.

PAPERS READ.

Mr. W. BELTON (Shrewsbury) next contributed to the proceedings a paper entitled "A Process Affecting Gas Purification and Sulphate Producing;" and this gave rise to a lengthy discussion. Mr. J. T. LEWIS (Wellingborough) subsequently read an interesting paper on "The Use of Charging and Drawing Machinery in Small and Medium-Sized Gas-Works." These, with a report of the discussions, we shall publish in an early issue of the JOURNAL.

At the close of the discussions,

The PRESIDENT proposed a hearty vote of thanks to the readers of the papers, which he said, had been upon exceedingly interesting subjects. They had both been very admirably put before the members, though, he thought, they should have had a little more active discussion upon the latter one.

Mr. CHARLES HUNT (Birmingham), seconding the motion, said he hoped Mr. Lewis would not think the want of discussion on his paper was attributable to any lack of interest in it. He need hardly assure him that the subject dealt with was a matter of considerable importance to all present; and, though they had not joined in the discussion, he must say that the paper had been put before them in a very lucid manner.

Mr. NORTH supported the motion, which was unanimously carried; and Mr. LEWIS briefly responded.

VOTES OF THANKS.

Mr. HUNT said there was another duty for the members to perform, and that was to pass a hearty vote of thanks to the retiring President for his admirable conduct in the chair during the year. They were prepared to expect great things from Mr. Paterson, who was a Past-President of the Association; but he had exceeded their expectations. He felt bound to say that his year of office had been one of brilliant success. The reception which he gave to the members at Cheltenham would long be rembered by them as one of the most pleasant and instructive excursions which the Association had made. If it were on that account alone, Mr. Paterson was entitled to their very hearty thanks; but for his uniform courtesy and urbanity in presiding over the meetings, their best praise and thanks were due to him.

Mr. J. F. BELL (Stafford), in seconding the motion, emphasized the eulogistic remarks made by Mr. Hunt.

The PRESIDENT said it was exceedingly gratifying to him to find, at the close of his year of office, that he had earned a little of the confidence which the members had in him at the beginning of the year. He then had a great deal of misgiving in again taking the chair; but he felt that, although he consented to take the position somewhat against his will, it had been a year of exceedingly pleasant association. He found his interest in their work had increased by his additional year of office; and he hoped it would continue. He begged most heartily to thank the members one and all for the kind support they had given to him; and he wished also to acknowledge the obligation they were under to Mr. Belton and Mr. Lewis for providing the papers for that meeting. The two former meetings this year might almost be called excursion meetings. They were very nice and agreeable; but, in his opinion, they were rather to be deprecated. One meeting in the year spent in that way was quite sufficient; and he thought they should keep up the interests of the Association by having two thoroughly business meetings in the year. This led him to another remark. He was not entirely without blame himself. It was impossible to keep up the business meetings twice a year unless the Secretary was ably supported by the members; and they would all have to make up their minds to do their share in the future in providing pabulum for the meetings, either by writing papers or verbally opening up subjects for discussion. They must all feel they had an individual responsibility in the maintenance of the prestige of the Association.

On the motion of Mr. NORTH, seconded by Mr. LEWIS, the members acknowledged their indebtedness to the Hon. Secretary, the Treasurer, and other officers of the Association.

Both Mr. MEIKLEJOHN and Mr. SIMPSON suitably responded; and this concluded the business on the *agenda*.

High tea was afterwards served in an adjoining room; and the members separated shortly before seven o'clock.

THE INNOXIOUSNESS OF THE INCANDESCENT GAS-LIGHT.

In view of the attacks which have lately been directed against the incandescent gas-light, more particularly in consequence of the report of Professor Gréhant, to which allusion was made in our editorial columns last week, the German Incandescent Gas-Light Company, Limited, of Berlin, have issued copies of statements by Professor Renk, the Director of the Hygienic Institute of the University of Halle, and Dr. Bunte, which present the case for the new light in such a form as to enable the reader to judge for himself whether or not the system is injurious to health. Professor Renk's valuable report was addressed to Dr. von Liszt, the Rector of the Halle University; and Dr. Bunte's remarks appeared in a leading article in a recent number of the *Journal für Gasbeleuchtung*. The results of the investigations of both of these authorities prove most clearly that incandescent gas lighting has no deleterious effect upon health. We give below translations of the documents referred to.

Hygienic Institute of the
University of Halle-on-the-Saale,
Sept. 30, 1894.

Most Honoured Sir,—With reference to the opinion submitted by me, under date Nov. 12, 1892, to the Trustee of the Royal University, and the consequent discussions in the Senate of the University which led to the introduction of Auer's (Welsbach) incandescent gas-lamps for lighting the lecture-halls

and all the various departments of the University, I now take the liberty to submit herewith a supplementary report. I considered it my duty to do so because certain statements which have been widely circulated in the daily press are calculated to throw some doubt, at least in one direction, on the advantages, particularly insisted upon by me, of the Welsbach light as compared with Argand and fishtail burners; and I considered this all the more called for because these press notices quoted the authority of an eminent French *savant*, who has repeatedly attracted the attention of hygienic experts by similar experiments to those I am now about to discuss.

The *Frankfort Gazette* was the first to reproduce, from the French periodical *La Lumière Electrique*, a notice to the effect that Professor Gréhant, of Paris, when analyzing the combustion gases produced by Argand and Welsbach burners, found that those of the Argand did not contain a trace of carbonic oxide, while those of the Welsbach contained a considerable quantity of this poisonous gas, and moreover an equally large quantity of (non-poisonous) carburetted hydrogen. The quantities of carbonic oxide, determined by the most exact methods, are said to have amounted to 1 part in every 4500 parts of combustion gases.

We can readily understand that a paper like *La Lumière Electrique*, being devoted to the promotion of electric lighting, would not miss this opportunity to throw discredit on a system which had most successfully stepped into the way of the further extension of electric lighting, by creating alarm among the public as to injury threatened by it to health, and advocating the total banishment of Welsbach light from inhabited premises. But it is much to be regretted that the daily press should have reproduced these warnings from the French technical journal without further inquiry, and given them the widest publicity without awaiting any expression of opinion from competent hygienic authorities as to the experiments and their actual significance.

It is just on this question of carbonic oxide—which not so very long ago kept analysts, physicians, and pharmacologists in constant excitement—that hygienic science has lately scored eminent successes, as the labours of sanitarians (such as Wolffhügel, von Fodor, and Gruber) have produced conclusive results; thus settling this much-disputed point. For this reason alone, it would seem that hygienic experts ought to be the most competent authorities on the matter here in question.

My reason for taking up this question is that the facts alleged to have been established by Gréhant are at variance with the assertion contained in my report of the 12th of November, 1892, to the effect that those products of imperfect combustion which give rise to the objectionable smell and unsanitary effects that are otherwise perceived in rooms lighted by gas, are entirely obviated in the case of the Welsbach light, thanks to its more perfect combustion of the gas on the principle of the Bunsen burner. In proof of this assertion (which is perfectly justified even from a purely theoretical point of view), I communicated some personal experiences which since then have been confirmed innumerable times; and after the installation of Welsbach light in the lecture-halls of our University, I have received grateful acknowledgments from many of my colleagues as to the improvement achieved thereby in the atmosphere of the lecture-halls.

We might certainly be tempted to assume that, as in all the previously mentioned instances a certain number of Argand burners had been replaced by an equal number of Welsbach burners, the quantity of products of imperfect combustion had been reduced by one-half, owing to the fact that the Welsbach light consumed only half the quantity of gas consumed by the Argand. But we must not lose sight of the fact that, in the Welsbach burner, the gas is burnt under entirely different conditions to those obtaining in the case of the Argand, and more especially that it is burnt on the principle of the Bunsen burner, in which, according to the unanimous statements of all manuals on chemistry and hygiene, nothing but carbonic acid and water are formed, while at most there is but a mere trace of the products of imperfect combustion.

In contrast to these statements, Gréhant's allegation that, in the case of the Welsbach burner, he had actually discovered carbonic oxide among the products of combustion, while he had found no trace thereof in the case of the Argand burner, must surprise us, to say the least, inasmuch as carbonic oxide also must be numbered among the products of imperfect combustion. At any rate, however, an experimental verification of the results of his investigations seemed imperatively called for. In order to effect this, I have made a series of experiments—the first of these being tentatively intended to trace, through the reaction of chloride of palladium, the presence of any carbonic oxide or carburetted hydrogen, or both, in the products of combustion. For this purpose, I proceeded on a plan somewhat different to that adopted by Gréhant. I aspirated a slow current of air through a tube of refractory glass, which was introduced with its downward-bent end into the chimney of a gas-lamp to a depth of about 2 centimetres (nearly an inch) below the upper edge of the chimney. Hence nothing except the products of combustion from the gas-flame could enter the tube, through which they were conveyed to a receiver containing acetate of lead, in which any carbonic acid and any sulphuretted hydrogen would be retained; and thence into a second receiver containing sulphuric acid, which would retain any ammonia present. After passing through these, the gases were passed into a "bulb (pipette) apparatus" filled with diluted neutral chloride of palladium solution.

I first tested a lamp with a Welsbach burner. During a period of fourteen hours, a volume of combustion gases equal to 14·2 litres was conducted through the chloride of palladium solution. After a lapse of about seven hours, I observed a slight discoloration of the chloride of palladium; and at the termination of the experiment, I determined the quantity of palladium eliminated, by quantitative analysis (by titration with iodide of potash solution, according to von Fodor's process), and calculated from this that the quantity of carbonic oxide introduced was 0·011 per thousand, or one part of carbonic acid to every 88,750 parts of combustion gases.

I then tested an Argand burner in like manner. During a period of twelve hours, 129 litres of combustion gases passed through the apparatus; but these gases were found to have likewise reduced some chloride of palladium, and that in such quantities as to suggest, on calculation, that they had parted with 0·007 per thousand, or one part of carbonic oxide for every 143,333 parts of combustion gases.

However, these two experiments only prove, primarily, that the combustion gases, both of the Argand and the Welsbach burner, contain such gases as will reduce chloride of palladium; but, in themselves, they do not yet prove that any carbonic oxide forms part of these gases. In order to settle this question, I had to resort to further experiments on a more elaborate method—viz., with the use of blood.

For this purpose, I adopted, in one instance, the following arrangement: I aspirated combustion gases for hours, in the same way as in the former experiment—passing them first through soda-lime, to eliminate carbonic acid; next through sulphuric acid, in order to eliminate any ammonia; and, finally, into a vessel (exsiccator) in which a live rat was contained. For four hours the animal remained there; and it did not exhibit the slightest symptom of discomfort while inhaling the combustion gases, freed from carbonic acid, of a Welsbach burner. At the end of this experiment, the rat was killed, and its blood was spectroscopically examined, with the result that not a trace of carbonic oxide was to be found in the blood.

In another instance, a large bottle (holding about 13 litres) was first filled with water, which was then drained off by the action of a syphon, so that combustion gases from a Welsbach burner were drawn into the bottle in place of the water run off, which gases, however, had previously passed through receivers containing soda-lime and sulphuric acid respectively. Fifty cubic centimetres of solutions of blood (10 parts of blood to 40 parts of water) were then poured into the bottle containing the 13 litres of combustion gases; the liquid was then agitated for 10 minutes; and after this it was poured out, and tested for carbonic oxide by von Fodor's process. This is done by slowly warming the blood fluid in a glass cucurbit, at the same time passing through it a current of air, which had previously been freed from any reducing agents present, by passing it through a receiver with chloride of palladium. This air, after passing through the blood solution, from which it will carry off any carbonic oxide contained therein, is conducted into a receiver containing acetate of lead; then another with sulphuric acid; and, finally, a third with chloride of palladium solution.

This experiment—continued for hours, according to Gruber's suggestion—whenever repeated, gave a negative result; from which fact we may conclude that the combustion gases of the Welsbach light contain no traces, or at least no demonstrable quantities, of carbonic oxide. Similar experiments made with Argand burners gave a like result.

Collaterally with the experiments just described, others were made with a view to testing the atmosphere of lighted rooms for carbonic oxide by the minutest methods available. As from the outset, I considered any development of carbonic oxide gas by the Welsbach light exceedingly improbable, I purposely exaggerated in these experiments the illumination in a manner such as would scarcely ever occur in practical use, so as to effect, by the production of very large quantities of combustion gases, the largest possible accumulation of carbonic oxide (if any should really be formed) in the atmosphere of the illuminated room.

For this purpose, seven Welsbach burners were lit in a room of the Hygienic Institute, measuring about 90 cubic metres; the doors and windows being closed. A sample (of 13 litres) of the atmosphere in the room was taken after three hours. This sample of air was then shaken up with a dilute solution of blood (10 cubic centimetres of blood to 40 cubic centimetres of water). After 15 minutes' agitation, I poured out the solution; rinsed the vessel with water; and examined a small portion (one drop diluted with 10 cubic centimetres of water) by spectroscopic analysis. I found no carbonic oxide. The remainder of the blood solution poured off was tested for carbonic oxide by von Fodor's process, as described above, but likewise with a negative result, although the passing of an air current through the blood while being warmed was continued for over four hours.

In order to render the experiment still more minute, I subjected larger quantities of air to examination. While the seven lamps were still burning, I again filled the bottle holding 13 litres, which I had previously used, with air from the same room, added 50 cubic centimetres of blood solution, and shook it for 10 minutes. Whereupon, without removing the blood solution, I again pumped air from the room into the bottle in

large quantities, until I felt sure that the whole of the air contained in the bottle had been fully renewed. I then agitated the bottle again for 10 minutes, after which I again pumped in a fresh supply of air, and continued the above process three times over again at intervals of 10 minutes, so that at least $5 \times 13 = 65$ litres of air must have been brought into intimate contact with the blood solution. I then examined a small portion of the blood spectroscopically, as before; and finding that the result again was negative, I proceeded to the chemical test by von Fodor's process. But in this instance also, the chloruret palladium remained unchanged.

Hence it was found impossible to demonstrate, even by the minutest tests, the presence of any carbonic oxide in an exorbitantly illuminated room, after having had seven Welsbach burners alight for three hours.

In another instance, the experimental arrangement just described was modified so as to leave the same number of Welsbach burners (seven) alight in the same room throughout a whole night; a cage containing two white mice being deposited in the room overnight, with a view to making a spectroscopic examination of the blood of these mice after the experiment. Next morning, after the expiration of thirteen hours, the animals appeared to feel perfectly well; and no carbonic oxide could be traced in their blood, although the temperature of the room had risen to 34° C. (93° Fahr.), and the amount of carbonic acid contained in the room had increased to 5·8 per mille.

The bottle holding 13 litres, which has been repeatedly alluded to above, was thereupon refilled eight times in succession with air from the room in question, at intervals of 10 minutes, during which each fresh charge of air in the bottle was thoroughly agitated together with a dose of solution of blood. After having consequently brought in this way at least $8 \times 13 = 104$ litres of air from the room into contact with the blood solution, the latter was subjected to the spectroscopical as well as to the chemical test; but invariably with a negative result.

From the results of all these experiments, we are enabled to form a conclusive opinion as to whether Welsbach burners will produce carbonic oxide in quantities which could have injurious effects on human health. In the first place, the experiments have shown that carbonic oxide—if any at all be present in the products of combustion of the Welsbach burner—is present therein in infinitely smaller quantities than is asserted by Gréhant, since a test by von Fodor's process (being based on the absorption of carbonic oxide by blood, expulsion of the gas from the blood, and absorption thereof by chloruret of palladium solution), if executed with all due precautions, is sufficiently accurate to permit of determining, with certainty, any admixture of carbonic oxide in air down to 0·05 per mille, or 1 part of carbonic oxide in every 20,000 parts of air. Hence if no results are obtained by von Fodor's system, there cannot be more than 1 part of carbonic oxide contained in every 20,000 parts of the air examined; and such a small quantity cannot prove injurious to human health.

We are indebted to Gruber for having demonstrated in a conclusive manner that a certain proportion of carbonic oxide may be present in the atmosphere without evoking any symptoms whatever of injurious action on the human system, and that even in the event of protracted respiration of air containing carbonic oxide in such an innocuous proportion, no accumulation of this gas will occur in the body. According to Gruber's statements, carbonic oxide may be traced in the atmosphere by von Fodor's test even if present in proportions far below the limit of injurious action, which limit, however, according to his beautiful experiments made on himself, is to be put down at 0·2 part per mille (1 part of carbonic oxide in every 5000 parts of air).

If we take all these facts into consideration, we must at the very least describe the assertions of the French technical journal as being enormously exaggerated. According to my own experiments, it is quite preposterous to assert that the combustion gases of a Welsbach burner could by any possibility be injurious to human health owing to any carbonic oxide contained therein.

Even supposing the figures given by Gréhant to be correct as regards carbonic oxide, this conclusion would still hold good, as the ratio of 1 in 4500 corresponds to a proportion of carbonic oxide equal to 0·22 per mille, which figure is but a trifle in excess of the limit of injurious action of carbonic oxide. Moreover, we must not lose sight of the circumstance that Gréhant found the above ratio of carbonic oxide by examining the combustion gases themselves of the Welsbach burner, and that, as these gases on leaving the cylinder would always undergo a considerable dilution in the air of the illuminated room, the proportion of carbonic oxide introduced into the atmosphere of the room would thereby be still further reduced, so as to fall very considerably below the limit of injurious action.

I have no means of ascertaining how it occurred that M. Gréhant found such a comparatively high ratio of carbonic oxide—possibly it may be due to the fact that he used a gas of different quality, or perhaps to the manner in which he collected the products of combustion. In any case, however, from a sanitary point of view, the inference drawn from his figures—to the effect that the Welsbach burner threatens injury to human health—must be decidedly repudiated.

(Signed) Prof. RENK,
Director of the Hygienic Institute.

The following is a translation of the article in the *Journal für Gasbeleuchtung* to which reference is made in our introductory remarks:—

INCANDESCENT GAS-LIGHT FROM THE HYGIENIC POINT OF VIEW

In a paragraph first published by the *Frankfort Gazette*, and which has since gone the round of a large portion of the daily press, a statement was made, on the authority of a French periodical not named, to the effect that M. Gréhant, the French physiologist, had demonstrated by experiments that, when ordinary gas-burners were used, not the least traces of carbonic oxide gas could be traced in the products of combustion; while in using the Welsbach incandescent gas-light, this injurious gas was generated in considerable quantities (1 in 4500). The latter portion of this statement, as regards the alleged result of these experiments, and the inference drawn therefrom that the Welsbach light ought to be banished from any human habitation, lest its inmates should be exposed every night to the risk of carbonic oxide poisoning, may be described as a gross exaggeration, while the first part is absolutely false. Carbonic oxide is invariably contained in the products of combustion emitted by any ordinary gas-burner, although in such small quantities as to preclude all risk of injurious effects on the human system. But in non-luminous flames, like that of the Welsbach burner, the gas undergoes a far more perfect combination; so that none but almost infinitesimal traces of imperfect products of combustion can be found. Professor Vivian B. Lewes, of London, in one of his classical papers on "Gas Lighting" read before the Society of Arts on Dec. 22, 1890, declared that, in the products of combustion emitted by a luminous gas-flame, he had found 1·189 per cent. of carbonic oxide, and 0·072 per cent. of carburetted hydrogen; while in the products of a non-luminous flame, he found 0·006 per cent. only of carbonic oxide, and 0·003 per cent. of carburetted hydrogen. The experimental methods adopted by Lewes are scientifically unassailable; and the results obtained thereby, being in direct contradiction to Gréhant's results, may claim all the more reliability because they are in perfect agreement with rational considerations, with the experiences of gas consumers, and with the statements of German investigators. We know that the "non-luminous" gas-burner has far more perfect combustion than an ordinary one, and further that the Welsbach burner, for an equal amount of light, requires but one-fourth of the volume of gas consumed in burners of the old style. Hence, of course, the quantity of deleterious constituents contained in the products of combustion must be very much smaller accordingly. As a matter of fact, reports are being received on every hand to the effect that the deterioration of the atmosphere observed while ordinary gaslight was in use has been absent since the substitution of the Welsbach light.

At the conclusion of the newspaper paragraph in question, its writer asks what position will now be taken, in view of Gréhant's results, by the Prussian Ministry, who last year, in an official circular, had so highly recommended the introduction of Welsbach burners in class-rooms and lecture-halls. This question, no doubt, may be disposed of by a reference to the fact that this recommendation by the Ministry was based on a report of the Physico-Technical Institute, and on the results of experiments made by Professor Renk, Director of the Hygienic Institute of the University of Halle.

The last-named expert, in his report made after thorough investigation, says, among other things (Head 2): "The incandescent gas-light pollutes the atmosphere considerably less than any other gas-flame. It generates but one-half of the quantity of carbonic acid emitted by ordinary gaslight, and none, or but infinitesimal quantities, of products of imperfect combustion, and less than one-half of the heat generated by an ordinary burner, and it never smokes." And further, at the end: "According to these results, the Welsbach incandescent light is a triumph in the *technique* of lighting which is of the highest importance in sanitary respects."

As the newspaper paragraph in question looks very much like an attempt to resuscitate the absurdly exaggerated statements circulated in former days as to the injurious effects of gaslight on human health, it may not be inappropriate to refer to the exhaustive experiments made in 1890 at the Hygienic Institute of the Marburg University, on the strength of which D. Ed. Kramer thought fit to express an emphatic opinion in favour of the relative innocuousness of gaslight.

Dr. Meidinger, Professor and Court Councillor, who has long been combatting this absurd "carbonic oxide" scare, when writing the other day on this subject, after remarking how much carbonic oxide is developed in the smoke of a cigar, supplied a *reductio ad absurdum* in the following words: Let us then give up cigar smoking; let us give up visiting public-houses or restaurants, where the poisonous carbonic oxide is accumulated a hundredfold; let us renounce every kind of conviviality and all the little comforts of life."

The *Electrotechnische Zeitung*, which in its No. 33 reproduced the paragraph of the *Frankfort Gazette*, remarked, in an editorial note, that more recent experiments made by M. Gréhant had convinced him that, after all, the amount of carbonic oxide emitted by the Welsbach incandescent light is materially less than appeared from his first experiments. The quantities generated are now said to be so exceedingly small as to preclude even the slightest risk of any detrimental effect on the human system.

In order to test the correctness of M. Gréhant's first assertion, a series of exhaustive experiments have been made in the chemical laboratory of the "Technicum" at Winterthur, by Professor Dr. E. Bosshard, at the request of the Winterthur Municipal Gas-Works. Professor Bosshard states in his preliminary report as follows: "In these experiments, the most delicate method of test for carbonic oxide reaction was employed—viz., by its absorption in diluted blood, and spectroscopic examination." In a room measuring about 70 cubic metres of air-space, without any artificial ventilation, and fitted with well-closing doors and windows, a Welsbach light was burning for about six hours. One hundred litres of air were then collected above and near the burner; and on testing this air in the manner stated, not a trace of carbonic oxide could be found in it. Experiments were then made in a small room, measuring 22 cubic metres only, likewise without ventilation, and with well-closing doors and windows. In this room, nine Welsbach lights were burnt—in one instance for one hour, and in another for two hours. The temperature rose during the experiments to 35° C. (95° Fahr.); being measured at man's height. In 85 litres of air, collected at a height of about 20 inches above the row of burners, no trace of carbonic oxide could be found in either experiment. In some further experiments, the combustion gases were aspirated immediately above the chimney of a burner. After one hour's burning, no carbonic oxide could be found. It was only after five hours that a traceable quantity had been formed, which, however, appeared so minute as to render a quantitative determination impracticable.

These experiments show that no danger to health can arise from the normally burning Welsbach lights. The quantities of carbonic oxide produced are so infinitesimal as to be quite inappreciable even when a very large number of lights are burnt, and at any rate are not larger than in any other system of lighting, either by gas or oil.

OIL GAS.

A contribution to the records of the American Chemical Society has recently been made on the above subject by Messrs. W. A. Noyes, W. M. Blinks, and A. V. H. Mory, of the Rose Polytechnic Institute, Terre Haute (Ind.). It is given in the *American Gaslight Journal* for the 15th inst., from which we reproduce it.

Some years ago, Armstrong and Miller made a study of the gas from petroleum by subjecting it to a high temperature, and of the oil deposited on condensing the gas. The following study of the gas made from petroleum by a somewhat different process, and which gives in certain respects different results, may be of interest.

In the Pintsch system, as described by Armstrong and Miller, two Ω-shaped retorts of cast iron are set one above the other; the largest size in use being 6 ft. 4 in. long, 10 inches wide, and 9¾ inches deep. The retorts are heated to a bright cherry-red; and the oil may be run into the upper retort at the rate of about 12½ gallons per hour. About 80 feet of gas per gallon of oil is considered a good yield.

By the Citizens' Fuel and Gas Company, of Terre Haute, gas is made from petroleum in large generators—one having a capacity of about 450 cubic feet of gas per minute, and two smaller ones with a capacity of 250 feet per minute, during the generation of the gas. The larger generator consists of an outer cylindrical shell of ⅜-inch boiler steel, 20 feet high and 8 feet in diameter, lined with fire-brick to a thickness of 16 inches. The interior is composed of alternate chambers and checkerwork compartments of fire-brick. Starting at the bottom, there is an open chamber to the height of 2½ feet; then, resting upon six 12-inch arches, the checkerwork of brick is built up—rows of brick, touching end to end and 2½ inches apart, extending from wall to wall, composing the first tier. Upon these, other rows are laid at right angles to the first; then the next tier, so as to be directly over the open squares formed by the first two rows; and so on, making the checkerwork to the height of 5½ feet. The bricks are laid in one upon another, without mortar or fire-clay. Above this checkerwork is a chamber 3 feet high, then arches and more checkerwork for 5½ feet, and then another chamber extending to the top. A heavy iron door, 14 inches in diameter, is provided at the top. By opening and shutting this, it is made to act as a regulator for equalizing pressures when reversing operations.

For heating the generator, oil is injected into the top and middle chambers by means of a steam-jet; air being also admitted at the same points through 5-inch valves. For generating gas, oil is injected into the top chamber through three jets. The gas which is formed leaves the chamber at the bottom through a 16-inch pipe, lined with fire-brick, and leading into the water-seal. The gas as it leaves the generator is too rich for burning in ordinary burners; hence in the seal-box it is diluted with ordinary air injected by steam through a 4-inch pipe into the top of the seal. In the process as formerly used, this air was injected into the generator with the oil; and the oxygen which it contained appeared as carbon dioxide and carbon monoxide in the gas produced. This form of the process is still in use elsewhere. The seal-box is 3½ feet in height by 4 feet in diameter; and the pipe leading from the generator dips 8 inches below the water surface. A stream of cold water runs continuously into the seal-box, condensing the tar, which is carried with the overflow water into the tar-well. From the seal the gas passes through a tower scrubber 20 feet in height, where it is washed with cold water, then through a tubular condenser, from this through a second scrubber, and then through two purifying boxes, 14 ft. by 14 ft. by 3 ft., with a 24-inch seal. From the purifiers the gas passes through the station meter, and thence to the holder. The purifying material used is technically known as "Laming's mass," and is prepared by treating wood shavings with copperas and lime—four barrels of copperas and about the same quantity of lime being used to 300 bushels of shavings.

The destructive distillation of the oil in the process of gas making is an endothermic operation—large quantities of heat being taken up from the hot brickwork; and the operation can only be carried on from seven to ten minutes at a time, when the heating must be recommenced and continued for approximately the same length of time. The temperatures in the generator were measured by noting the melting-points of salts. The salt was wrapped in platinum foil. This was placed in a sheet-iron tube attached to an iron rod; and the insertion was made through a hole in the side of the generator. Measurements of the lowest temperature were made by introducing the salts immediately after the gas making ceased, and withdrawing them at the end of two minutes. Sodium chloride was unaltered in all trials at the first temperature; potassium chloride fused in about three minutes; while potassium bromide melted in less than two minutes. The lower temperature is therefore between the melting-points of potassium bromide and potassium chloride. At the highest temperature, sodium carbonate fused; but calcium fluoride was unaltered. Experiments with sodium sulphate were rejected, because the salt was apparently reduced by the gases to which it was subjected.

In assigning a temperature in degrees, some difficulty is experienced, as authorities differ as regards the melting-points of these salts. The following values are given by Carnelly, and quoted in the works of Mills and Rowan on "Fuels," and by Victor Meyer and Riddle. The values of the latter, however, are stated as being preliminary only; and the melting-point of sodium carbonate especially is stated, in a later paper, to be too high.

	Carnelly. Deg. C.		Meyer and Riddle. Deg. C.
Potassium bromide	—	..	715
Potassium chloride	734	..	766
Sodium chloride	772	..	851
Sodium carbonate	814	..	1098
Calcium fluoride	902	..	—

The lower temperature may be stated with some degree of certainty as being about 750° C.; while the higher temperature is probably 900° to 1000° C.

The following determinations of the technical compositions of the gas were made with Orsat's apparatus; the determinations of methane and hydrogen being made by explosion with an excess of air and the addition of oxy-hydrogen gas—the large amount of methane rendering an explosion with air alone almost impossible. The illuminants were determined by absorption in fuming sulphuric acid. The first two determinations were duplicated with Hempel's apparatus, with almost identical results. The "total carbon" in the gas was determined by exploding a known volume of the gas with an excess of air and determining the volume of carbon dioxide formed. The ethylene and propylene are calculated on the assumption that the illuminants consist exclusively of these two gases. It is well known, of course, and will be further shown below, that this is not the case; but, for the purpose of calculating the heat of combustion of the gas, the error introduced is slight, and is certainly less than on the assumption usually made that the illuminants consist entirely of ethylene. The heat of combustion is calculated on the basis of one cubic foot of the gas at 0° C., burned to carbon dioxide and vapour of water. The following values are used, deduced from the values given in Winkler's "Technische Gasanalyse":—

One cubic foot of ethylene				gives	1573·3	English heat-units.		
" " "	propylene			"	2324·8	"	"	"
" " "	carbon monoxide			"	342·4	"	"	"
" " "	methane			"	964·3	"	"	"
" " "	hydrogen			"	289·8	"	"	"

	Feb. 20. Undiluted Gas		Per Ct.	Feb. 20. Diluted Gas		Per Ct.	May 22. Diluted Gas		Per Ct.	June 5. Diluted Gas		P. Ct.
Carbon dioxide	2·3	..		2·1	..		0·7	..		0·8		
Illuminants	28·1	..		19·9	..		19·3	..		15·9		
Oxygen	0·2	..		5·9	..		7·0	..		7·7		
Carbon monoxide	0·6	..		1·8	..		0·0	..		0·0		
Methane	44·8	..		32·2	..		33·2	..		36·0		
Hydrogen	20·5	..		14·2	..		6·9	..		6·1		
Nitrogen	3·5	..		23·9	..		32·9	..		33·5		
	100·0			100·0			100·0			100·0		
Total carbon = carbon dioxide	115·7	..		85·6	..		85·5	..		77·0		
Illuminants (Ethylene	16·2	..		10·3	..		6·3	..		7·5		
Illuminants (Propylene	11·9	..		9·6	..		13·0	..		8·4		
English heat-units per cubic foot.	1025·0	..		744·0	..		741·0	..		678·0		

The small amount of carbon dioxide and carbon monoxide present in the gas is worthy of especial remark. Steam is used

to inject the oil into the generator; but the analyses show that the steam must pass out at the end almost entirely unchanged. It follows from this that, in an atmosphere of reducing gases, and at a temperature of 700° to 900° C., it is impossible to burn carbon to carbon monoxide or dioxide by means of steam. This is still more apparent in those forms of the process in which air is introduced into the generator. One of us has made many analyses of gases produced in this way; and in every case the oxygen of the carbon dioxide and carbon monoxide combined was less than that of the air introduced. These facts have a very important practical bearing as regards the use of steam with petroleum in the manufacture of gas. The gas directly from the producer contained 1·83 grains of sulphur per cubic foot; the purified gas, 0·025 grain.

The amount of oil required for 1000 cubic feet of gas varies somewhat with the condition of the generators. The following determinations were made:—

(1) *Feb.* 20.—One run of the large generator when it was about to be shut down for repairs.

Oil per 1000 cubic feet of diluted gas, for heating .	2·3 gallons.
" " " " generating	10·7 "
Total	13·0 "

(2) *June* 5.—Average of five runs of the large generator just fitted with new brickwork.

Oil per 1000 cubic feet of diluted gas, for heating .	1·4 gallons.
" " " " generating	9·7 "
Total	11·1 "

On comparing the analyses, it will be seen that the gas of June 5 was diluted somewhat more than that of Feb. 20; so that the real difference in efficiency is only about 6 per cent. As the oil used was not the same, and that of June 5 was apparently of better quality, no reliance can be placed on the difference.

So much time was taken for other parts of the work, that these determinations were not repeated so frequently as they should have been. Apparently, however, about 10 gallons of oil are used in the large generator for producing 1000 cubic feet of diluted gas, and 1·5 to 2 gallons of oil are used for heating. When we consider the amount of the dilution, these results are somewhat lower than those reported by Armstrong and Miller. Unfortunately, they give no analyses of the gas.

The oil used on Feb. 20 contained some water; and an analysis gave: Carbon, 81 per cent.; hydrogen, 12·7 per cent.—the specific gravity being ·843. The oil used on June 5 was nearly free from water, and had a specific gravity of ·865.

We will take the run of June 5 as a basis for calculating approximately the efficiency of the plant. If we assume the oil to contain 86 per cent. of carbon and 14 per cent. of hydrogen, a gallon of the oil would give, when burned to vapour of water, about 140,000 English heat-units; and the amount of oil required for the manufacture of 1 cubic foot of gas would give about 1550 English heat-units. Since the gas itself gives 678 units per cubic foot (see analysis), about 44 per cent. of the heating power of the oil is found in the gas. Without going into the details of the calculation, it may be of interest to state that about 35 per cent. of the heating effect of the oil used in heating the generator is lost by reason of the high temperature of the smoke gases; and an approximately equal amount of heat is carried away by the gas during the generation of the latter. It is probable that at least 10 per cent. of the heating effect of the total oil used is lost in this way, though the calculations do not show quite that amount. The remainder of the loss appears to be due mainly to the formation of tar.

On May 21 a test of the candle power of the diluted gas, as furnished to consumers was made, using a Lumner-Brodhun photometer with a 3-metre bar. The Methven slit was used as the direct standard; its value being first determined in terms of a standard amyl-acetate lamp, which was taken as of 1-candle power. A wet meter, which, during one minute, indicated the number of cubic feet of gas burned per hour, was used. Readings were taken on the meter and photometer each minute for five, and sometimes ten, consecutive minutes. Averages of these readings were made; and the gas consumption was corrected for temperature. The first night, tests were made using an Argand, a 5-feet batswing, and a small and large Welsbach burner. The second night, tests were carried out with a view to determining the relative efficiencies of different sizes of batswing burners, and of each size burning under different conditions—those chosen being a smooth flame with a consumption rather under the indicated amount, and a large forked flame burning as high as possible without blowing. The appended table shows the results obtained:—

May 22.—Methven = 2·57 Candles.

Burner.	Candle Power Found during the Test.	Gas Burned per Hour during the Test.	Candle Power. Corrected for 5 C. Ft. per Hour.
Argand	29·30	5·17 cub. feet	28·40
Five-ft. batswing .	33·90	5·27 "	32·20
Small Welsbach .	31·40	3·25 "	48·30
Large Welsbach .	57·13	6·06 "	47·10

May 23.—Methven = 2·36 Candles.

Nature of Flame.	Burner.	Candle Power Found during the Test.	Gas Burned per Hour during the Test.	Candle Power Corrected for 5 C. Ft. per Hour.
Smooth	2-ft. batswing	14·20	3·21 cub. ft.	22·12
Forked	" "	23·32	5·54 "	21·05
Smooth	3-ft. "	18·53	3·49 "	26·54
Forked	" "	30·02	6·32 "	23·75
Smooth	4-ft. "	19·66	3·43 "	28·66
Forked	" "	37·45	6·74 "	27·78
Smooth	5-ft. "	28·00	4·47 "	31·32
Forked	" "	39·88	6·43 "	31·01
Smooth	6-ft. "	25·01	3·96 "	31·58
Forked	" "	45·01	7·06 "	31·87
Smooth	7-ft. "	29·32	4·43 "	33·10
Forked	" "	53·18	8·27 "	32·15

It will be seen that the larger burners are most efficient, and that, with one exception, the smooth flame gives better results. This is especially true of the smaller burners. A sample of the gas taken on May 22 gave for the calculated heating effect 741 English heat-units. The statement of the analysis is given elsewhere.

In order to determine the presence and the amount of benzene and similar hydrocarbons in the gas, these were determined by a modification of the method of Hempel and Dennis, and also by absorption in absolute alcohol and subsequent dilution with salt water. Both methods gave essentially the same result, and showed that about 1·2 per cent. by volume of the gas consists of the vapour of these hydrocarbons. From the oil obtained by the second method, pure metadinitrobenzene was easily obtained by nitration and crystallization.

To determine the composition of the other gases forming the illuminants, gas coming direct from the generator was aspirated through an absorption train, consisting of two 1-litre bottles, packed in ice to condense the tar, then two ½-litre bottles half filled with an ammoniacal solution of cuprous chloride to absorb acetylene; next a bottle of the same size half filled with dilute sulphuric acid to absorb ammonia fumes from the cuprous chloride solution; then three Drechsel wash-bottles standing in ice water, the first two containing 100 grammes each of bromine with about ½ inch of water above, and the third containing distilled water for the collection of bromine carried over from the other two; and finally a wash-bottle half full of a solution of sodium hydroxide to absorb bromine fumes. Approximately, 125 litres of gas were passed through the train to effect the saturation of the bromine. The bromine compounds were washed twice with caustic soda, and afterwards with distilled water, then separated, dried with calcium chloride, and fractioned. More than half came over between 127° and 150°. The residue remaining in the distilling-bulb solidified on cooling. It was crystallized from alcohol and from ligroin, when it melted at 113° to 113·5° C. An analysis gave the following results:—

0·0750 gramme gave 0·1500 gramme of silver bromide.

	Calculated for $C_4H_8Br_4$.	Found.
Bromine	85·56	85·11

Armstrong and Miller obtained a bromide melting at 116°, which they considered to be divinyl tetrabromide (1, 2, 3, 4 tetrabrombutane). The substance described above was probably the same, but less pure, as we worked with much smaller quantities.

The portion of the bromides boiling from 127° to 150° was redistilled, and gave three fractions—the largest from 129° to 133°, that from 133° to 139° next, and that from 139° to 143° least. After fractioning again, a determination of the molecular weight by the air-displacement method of Victor Meyer was made with the portion boiling at 130° to 133°. The results agreed fairly with the molecular weight of ethylene bromide. Determinations of the molecular weight of the fraction boiling from 140° to 143° were unsuccessful, owing to the decomposition of the bromide. There can be little doubt, however, that the bromides consisted chiefly of ethylene and propylene bromides; the former being present in much larger amount than the latter.

A considerable precipitate was obtained in the ammoniacal solution of cuprous chloride—indicating the presence of appreciable amounts of acetylene and its homologues. In this respect, our results differ from those of Armstrong and Miller.

The amount and character of the tar vary considerably with the conditions of running. Two samples of the tar were examined—one which was thick and viscous, another which was comparatively thin. No essential difference in qualitative composition was established. The lower boiling substances contained in the tar were separated by distillation with superheated steam; the higher boiling products, by direct distillation. In the direct distillation, much trouble was experienced from frothing; and it was found necessary to heat the tar at first in small quantities in an open dish until the frothing ceased. The residue was then distilled as usual.

Without going into the details of the work, the results of the study may be stated briefly as follows: Benzene and its lower boiling homologues appear to be present in the tar in only small amount. No positive evidence of their presence was obtained, although it has been shown that benzene is present in the gas. Naphthalene was present in considerable amount, and was identified by both melting-point and boiling-point. Anthracene was also present, and was identified by melting-point and by

conversion into anthraquinone. An approximate quantitative determination of the amount of anthracene was also made, showing the presence of about 0·35 per cent. From the portion coming over at about 425°, there was obtained, by crystallization, a solid melting at 250°, and probably crysene. From the portion boiling still higher, a green crystalline solid melting at about 240° was obtained, but not in sufficient amount for its identification. Attempts to isolate phenol were unsuccessful, though it was probably present in small amount.

The results of the investigation confirm the conclusion of Armstrong and Miller that benzene and allied hydrocarbons may be formed at high temperatures from hydrocarbons which bear no simple relation to them.

STATISTICS OF WATER GAS.

In the *American Gaslight Journal* for the 8th inst., there was an interesting communication, from "An Old Contributor," in regard to the different systems of making water gas. He says that, having perused the admirable paper read by Mr. James Stelfox at the last meeting of The Gas Institute, as given in the JOURNAL for June 26 last (p. 1225), he felt moved to submit a few items of results obtained from apparatus mostly under his personal observation, or received by him from entirely trustworthy sources, after visiting and carefully inspecting the processes in operation. He adds that the figures in his tabular statement may be relied upon as absolutely correct, so far as the apparatus specified and its special location at the time the particulars were given are concerned. In most systems, the oil was used in the form of naphtha, which has more candle power than any other oil; and the quantities used were originally given in American gallons (231 cubic inches). In order to render the figures more useful to English readers, a correspondent has converted these into English gallons (277·274 cubic inches), and calculated the illuminating power by the latter standard; and the results are given in the following table :—

Name or Style of Apparatus.	Naphtha, Gallons Used per 1000 Cubic Feet.	Crude Oil, Gallons Used per 1000 Cubic Feet.	Total Oil Used per 1000 Cubic Feet.	Pounds of Coal Used in Generators.	Candle Power of Gas Produced.	Candle Power per English Gallon.	Quantity of Gas Made in a Day's Work per Man at Apparatus.*	Daily Capacity of Apparatus from which these Averages were Taken.
							Cubic Feet	Cubic Feet.
(1) Improved Lowe. . . .	3·73	..	3·73	40·2	24·0	6·433	75,000	300,000
(2) Granger-Collins. . . .	3·65	..	3·65	40·3	20·0	5·479	75,000	300,000
(3) Springer	4·23	..	4·23	39·9	18·4	4·349	120,000	1,500,000
(4) Pratt and Ryan	3·91	..	3·91	42·6	19·0	4·859	120,000	1,250,000
(5) Enger.	0·60	2·81	3·41	30·9	20·8	6·099	87,585	300,000
(6) Flannery	4·00	..	4·00	42·9	26·0	6·500	80,000	2,400,000
(7) Rose	3·34	..	3·34	91·5	24·0	7·185	not known	150,000
(8) Loomis	3·84	..	3·84	44·8	25·0	6·510	81,500	3,000,000
(9) H. C. Rew	..	3·45	3·45	36·0	26·0	7·536	66,666	400,000
(10) do.	..	3·73	3·73	48·0	26·0	6·097	66,666	400,000
(11) Jerzmanowski	5·20	2·28	7·48	Oil fire	27·0	3·060	150,000	150,000 to 1,000,000

Remarks.—The kind of fuel used in the generators or retorts, and the period to which the figures relate, are as follows: (1) Anthracite; one month, about twelve hours a day. (2) Do., do. (3) Anthracite and coke; average for a year. (4) Do.; whole year. (5) Gas coke; one year. (6) Anthracite; full time. (7) Gas coal; experiment. (8) Semi-bituminous steam coal; full time. (9) Youghiogheny gas coal; about quarter time. (10) Du Quoin nut steam coal; do. (11) Naphtha in the retorts, and crude oil in the furnaces; do.

* The gentleman who furnished the particulars to our contemporary explains that the figures in this column should not be taken as a criterion of the efficiency of the apparatus, but only such results as had come within his observation during upwards of 14 years' practical experience in making carburetted water gas in different parts of America.

Water-Works Extensions at Preston.—At a meeting of the Preston Town Council last Thursday, it was unanimously agreed to accept a tender of the Stanton Iron Company, of Nottingham, amounting to £21,394, for the supply and delivery of water-pipes required for the new storeage reservoir which is being constructed at Alston, near Longridge.

The Position of the Leicester Corporation Water Supply.—No official information regarding this matter is to hand this week. A reporter of the *Leicester Journal*, however, states that last Thursday he viewed the Cropstone and Thornton reservoirs. With respect to the first-named reservoir, he compares it to a "shallow pond, with a superabundance of mud approaches," and states that the water is many feet below the lowest mark on the 8-feet measuring post. The state of affairs at Thornton, however, did not appear to be so bad, though the water was low.

The Unification of the Malverns and the Water Supply.—An inquiry is in progress respecting the unification of Great Malvern, Malvern Link, West Malvern, and Malvern Wells, for the purposes of local government. The inquiry was opened in March last by Mr. J. W. Willis Bund, the Chairman of the Worcestershire County Council; but he was not then satisfied that the new water scheme of the Malvern Local Board (who are the petitioners) would be adequate for the districts proposed to be united, and the proceedings were adjourned to allow the works to be completed and fresh evidence to be called. Last week the inquiry was resumed. Mr. G. F. Deacon was one of the witnesses; and he described in detail the new water scheme, which, he said, would give 259,000 gallons per day for the whole of the driest season which could be experienced. With pumping and enlarged collecting area, the daily supply could be brought up to 314,000 gallons. He estimated that a constant and unrestricted supply at high pressure of 15 gallons per head per day could be given, and that 263,000 gallons would satisfy a population of 17,533. The new scheme would be ample for all the Malverns. Mr. Copland, the Engineer of the new works, also gave evidence; and he was subjected to a long cross-examination. He admitted that the success of his scheme entirely depended upon his ability to collect 10 inches out of the 24 inches of rain which fell in an average year. In the past nine months, he had collected only 3 inches out of 21; but he declined to base his scheme upon the rainfall of any one year. He had always gone on the returns of three dry years; and he claimed to be able to collect nearly the whole of the 10 inches on an average, but not in any one year. The loss by evaporation and absorption might in one year be 17 or 18 inches, and in another only 7 or 8 inches. Since Oct. 1, 2 million gallons had run into the reservoir, in addition to what had been used to supply the town. He was perfectly satisfied with the way the reservoir was filling; nearly 10 million gallons having been collected in the past month. Mr. Baldwin Latham gave evidence for the opposition. In his opinion, the scheme would never give even Malvern itself an adequate supply of water. The inquiry was then adjourned *sine die*.

The Dewsbury and Heckmondwike Water Board.—The Dewsbury Corporation last Thursday resolved that they would, either alone or in conjunction with the Dewsbury and Heckmondwike Water Board, promote a Bill in Parliament in the ensuing session for all or some of the following purposes: To authorize the Board or Corporation to construct further water-works, to acquire an additional source of water supply in or near the watershed of the Little Don river, to authorize the Corporation to purchase or acquire the share of the Heckmondwike Local Board in the Joint Water Board, to dissolve that Board, and to borrow money for the purposes named.

Fylde Water-Works Company.—The half-yearly report of the Directors of this Company, which was adopted at the shareholders' meeting last Wednesday, stated that the water and other receipts, including a balance of £1091 brought forward, amounted to £15,482. Working expenses absorbed £3670; and this with other items made the expenditure £5032—leaving a balance of £10,178. The following dividends were recommended: On preference stock, 4 per cent.; on stock "A," 10 per cent.; and on stock "B," 7 per cent. After paying these, there will be a balance of £1138 to be carried forward. The sinking fund is to be closed by a transfer of £5000 from the reserve fund, and £20,000 issued by new consolidated "B" stock under the Act of 1881. No reference was made in the report to the proposed purchase of the undertaking by the Local Authorities in the area of supply; but we understand that the Joint Committee have received a reply to a request which they made for an interview with the Company to the effect that inasmuch as the Parish Councils elections will take place in December, the Directors think that any interview on the matter should be deferred for the present. They also intimated that they were not aware of a desire on the part of any of the stockholders to sell their holdings.

Wakefield Water Supply.—At the last monthly meeting of the Wakefield City Council, the presentation of the minutes of the Finance Committee evoked from Mr. H. Smith a complaint of extravagant expenditure in connection with the water-works. He said their debt was equal to £22 5s. 3d. per head of the population, and their deficiency in the Water Department last year was upwards of £11,000, which was the largest deficiency in any water-works, big or little, in the United Kingdom. During the past eight years, the Corporation had paid no less than £14,000 for professional engineers; and they were committing themselves to another £3000. In Bradford, Keighley, and other places, such undertakings as water filtration works were carried out by local engineers at a quarter of the expense incurred at Wakefield. Alderman Booth, the Chairman of the Water Committee, said Mr. Smith was a member of the Committee, and ought to have taken objection there. The minutes were adopted. Mr. Riley then proposed that the Committee be instructed to report fully to the Council upon certain proposals made to them as to the filtration of the water supplied to the city, and not to proceed further with the construction of filtration works at Jaw Hill and Lindle Hill until the further orders of the Council. Mr. Simpson seconded the motion; but, after an acrimonious debate, it was lost.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, Oct. 25.

(*Before Justices* MATHEW *and* CHARLES.)

The East London Water-Works Company v. Kyffin.

This was an appeal from Mr. Lushington, one of the Metropolitan Police Magistrates, on a case stated by him, raising the question whether a "demand" was a condition precedent to proceedings being taken by the plaintiffs to recover a water-rate. Mr. Lushington held that it was, and that, in the absence of such demand, the summons was not sustainable. The proceedings in the Lower Court were reported in the JOURNAL for May 22 last (p. 968).

Mr. FINLAY, Q.C., and Mr. RAWLINSON appeared for the appellants; Mr. WALTER represented the respondent.

Mr. FINLAY first read the case, which stated that the respondent was summoned in April last to answer the appellants' claim of 16s., alleged to be due for water-rates chargeable in respect of a house in Hackney, the annual value of which did not exceed £20; thus making the owner liable. Half of this sum was claimed in respect of water-rates for two years ending Christmas, 1893; and the other half in respect of the two years beginning at Christmas and Lady Day, 1894; the rate being payable in advance. It was admitted that no demand had been made in respect of the two latter years, as and when they became due. It was contended by the appellants that no such prior demand was required; but the Magistrate was of opinion that, until such a demand had been made, the respondent's omission to pay the rate was not a neglect or refusal within the meaning of the section, and that, in the absence of such demand, no matter of complaint had arisen with which a Court of Summary Jurisdiction could deal. He therefore dismissed the claim for 8s., on the ground that no demand had been made for this sum, or any portion thereof, prior to the issue of the summons. The other part of the claim he dismissed on other grounds, in respect of which he had not been asked to state a case. The learned Counsel then proceeded to call attention to the various sections governing the matter—viz., the 81st section of the East London Water-Works Act, 1853, which makes the owner of houses of not more than £20 value liable to the water-rate; and sections 70 and 74 of the Water-Works Clauses Act, 1847, which provide that the water-rate shall be payable yearly in advance, and that if any person liable for the rate neglects to pay it, the supplying company may cut off the water, and may recover the rate in the same manner as any damages, for the recovery of which no special provision is made, are recoverable. He went on to say that, by subsequent legislation, the power of cutting off the water had been taken away in cases where the person liable for the rate was the owner and not the occupier of the premises. Section 85 of the Water-Works Clauses Act, 1847 incorporated the provisions of the Railways Clauses Consolidation Act, 1845, with regard to the recovery of damages not specially provided for; and he believed that section 140 of that Act was the one on which the question really turned. This section provided that, in all cases where damages, costs, or expenses were directed to be paid, and the method of arriving at the amount, or enforcing payment, was not provided for, such amount, in case of dispute, should be ascertained by two Justices; and if the amount so determined were not paid by the party liable within seven days after demand, it might be recovered by distress, and the Justices by whom the same had been ordered to be paid, or either of them, or any other Justice, should issue their or his warrant accordingly. Counsel submitted that the demand to be made was a demand after the order was obtained, and then seven days were to elapse before a distress warrant could issue for enforcing payment; and that it was misreading the section to suppose that there was any condition precedent to the order being made by the Justices in the first instance for payment. It was usual, as a matter of courtesy, to send a letter before taking action; but no one ever heard that such a letter was a condition precedent to the recovery of any amount legally due. This matter was considered in the case of *East London Water-Works Company v. Charles* (*ante*, p. 196); and though the actual decision was as to the applicability of the six months' limitation to proceedings before Justices in cases under the section to which he had called attention, the whole scope of the section was considered, and, as he submitted, the point now raised was decided in his favour. He concluded by reading the judgment of Mr. Justice Wills in the case mentioned.

Mr. WALTER said he did not wish to urge that the demand should be such as was contemplated by the section which had been cited. But he was instructed that here no application had been made for the rate; and it must not been inferred that the respondent even knew what amount he was called upon to pay until what was termed a "demand note" was delivered to him. The rate was to be one not exceeding 5 per cent. on the annual value of the premises. It was not a fixed sum payable quarterly; and, as he understood, the learned Magistrate put it in this way: How is anybody to pay until he knows what he has to pay? The respondent had never been informed what he had to pay. The first intimation he had was a summons to the Police Court.

Mr. FINLAY said his learned friend must not say that. There had been a good deal of litigation between the Company and the respondent, who, he was informed, went about lecturing on the rights and duties of water companies.

After some further argument,

Justice MATHEW, in delivering judgment, said he could not agree with the learned Magistrate that it was a condition precedent to his jurisdiction that there should have been a formal demand made. It was suggested that he might have arrived at this conclusion because of the use of the word "neglect," in section 74 of the Water-Works Clauses Act. But it appeared to him perfectly clear that there might have been a dispute of long standing between the Company and this owner, and that he might have known perfectly well what he was liable to pay, and had refused to pay on grounds which would be evidence of his neglect; and therefore it was not at all necessary, in order to establish neglect, that there should have been a formal demand made upon him. Section 85 of the Railway Clauses Consolidation Act had no bearing upon the case; the decision must depend on the construction to be put upon the two statutes—the Private Act of the Company and the Water-Works Clauses Act, 1847 By section 70 of the latter Act, it was clear that the rates were to be payable quarterly in advance—the first payment to be made at the time when the water was laid on, or the agreement to take the water made; and, as a matter of common sense and business, it was certain that, when the communication was made, there would be a clear understanding what the amount of the rate was to be. Then section 74 provided that, if any person supplied with water neglected to pay, certain steps might be taken, which were described. He could not agree with the learned Magistrate that any formal demand was necessary; and therefore the case must go back to him with an intimation that this was the opinion of the Court. They would leave him to deal with the costs, as there were other questions remaining to be settled.

Justice CHARLES gave judgment to the like effect.

BIRMINGHAM QUARTER SESSIONS.—Monday, Oct. 22.

(*Before Mr.* J. S. DUGDALE, Q.C., *Recorder.*)

The Rating of Gas-Mains, &c., in Aston.

At the opening of the sessions to-day, an appeal by the Corporation of Birmingham against the assessment of the works, mains, and other property connected with their gas undertaking, by the Overseers of the Parish of Aston, came before the Court; but it was announced that the following alterations had been agreed upon: Deritend and Bordesley—Mains and pipe-ways, from £4416 gross and £3680 net to £3864 gross and £3220 net; works, buildings, fixed plant, &c., from £6750 gross and £4500 net to £5250 gross and £3500 net. Adderley Street—Dwelling-house, from £38 gross and £32 5s. net to £35 10s. and £30 net. Duddeston and Nechells—Mains and pipe-ways, from £2736 gross and £2280 net to £2394 gross and £1995 net; works, buildings, fixed plant, &c., from £29,355 gross and £19,570 net to £28,519 gross and £19,013 net; dwelling houses and premises, from £118 15s. gross and £100 net to £69 gross and £68 15s. net. Saltley and Washwood—Mains, &c., from £648 gross and £540 net to £564 gross and £470 net; works, &c., from £14,745 gross and £9830 net to £15,750 gross and £10,500 net. Little Bromwich—Mains, &c., from £24 gross and £20 net to £19 5s. gross and £16 net. The total assessment, £58,830 gross and £40,552 5s. net, had been reduced to £56,464 gross and £38,812 15s. net.

The Assessment of the Birmingham Electric Supply Company, Limited.

The appeal above referred to was followed by one by the Birmingham Electric Supply Company, Limited, against the assessment made upon them by the Overseers of Birmingham.

Mr. FREEMAN and Mr. PARFITT appeared for the Appellants; Mr. A. YOUNG and Mr. H. YOUNG represented the Overseers.

Mr. FREEMAN, in opening the case, said the Company was formed in 1890, under a Provisional Order, and was subject, of course, to the Electric Lighting Act. Having gone through the history of the undertaking down to the extension of its area by the Provisional Order of last session, he said that in 1892 the Company was rated at £825 gross and £700 net. In 1893, by the simple process of doubling, the assessment was made £1650 gross and £1400 net. In the present year, the Overseers had not quite the courage of their previous efforts, but had added 50 per cent.—making the assessment £2475 gross and £2100 net; and this was the amount appealed against. This was a matter of considerable importance to the Company; and, practically, it was the first case in which the rating of an electric lighting undertaking had come forward for judicial decision. At present, the profits of these companies had been somewhat uncertain and precarious; and so far, he believed, no effort had been made to put the rating of them on a scientific basis. It was perfectly obvious that the Overseers had not assessed the Company upon any of the ordinary principles generally applied to the rating of companies; and, in the opinion of the Appellants, the gross sum was entirely wrong, while the net one had been incorrectly ascertained. They appeared to have adopted a rough-and-ready principle of taking 15 per cent. off the gross, to arrive at the net value. With regard to the details, the accounts generally had been accepted by the Overseers, though as they went through the case there might be some points on which they disagreed. He would point out that the Company differed in several respects from a gas company, which was the most closely analogous concern, as well as from a railway company, which was analogous in some matters. Going through the details, Mr. Freeman pointed out that the Company had adopted the practice of collecting their accounts at shorter periods than those adopted by gas companies—allowing a discount for prompt payment. Then there was the contract account, on which no profit was made; the Company undertaking certain work at cost price in order to induce people to use the light—the object being to increase the output, and so lessen the proportion of expenditure to revenue. Among the other special matters for consideration were the expenses of obtaining the Orders, and also the fact that, under the Electric Lighting Act, the Company's concession would terminate in 40 years—the Company being then in a similar position, though not quite so bad, as that of certain tramway companies under a recent decision. In this respect they were unlike a gas or a railway company, whose concession was unlimited. There was also this difference—that, electric lighting being to some extent in an experimental stage, there was a danger of some of the plant becoming obsolete, and having to be replaced long before it was worn out. The Company had suffered in consequence of the coal strike; and they decided to increase their stock of coal to 800 tons, which the witnesses would say was by no means excessive. Some dispute would arise with reference to the item of interest on the tenant's working capital—a subject affected by some of the previously mentioned considerations. The result, taking every item at the most

favourable figure to the Overseers which could justly be allowed, was, according to the Appellants' case, a net rateable value of something like £1400.

Mr. *T. Newbigging*, M.Inst.C.E., was then called, and gave, as the result of his investigation of the Company's accounts, the following estimate: Receipts—Generation and distribution account, £10,227; contracting account, £1951; total, £12,178. Expenditure—Generating and distribution account (including £300 Directors' fees and £700 salary of Engineer and Managing-Director), £4850; contracting account, £2002. To the expenditure he added £49 for tenant's income-tax, and £471 for local rates; making the total £7372, and giving the net receipts as £4806. The tenant's working capital he estimated at £7319; and the interest on this at 5 per cent. (£366), with 10 per cent. for trade profits (£732), 2½ per cent. for risks and casualties (£183), and 2½ per cent. for the compulsory termination of the concession (£183). This made a further deduction of £1464; leaving the gross estimated rental £3342. The statutable deductions, he put as follows: Repairs, maintenance, &c., £341; renewals of buildings, £1569; and insurance on £20,000, at 2s. per cent., £20—total, £1930. This gave a net rateable value of £1412.

In cross-examination, witness said he considered the accumulators as chattels, not hereditaments. They were not essential, and many electric supply companies did without them. They were employed for storeage, as was a water company's reservoir; but the latter he considered indispensable to a water undertaking. The Birmingham Company had six generating machines; so that, even without accumulators, there was no danger that the light would go out. He regarded the loss on the contract account as a natural incident of the business, and not as an accident of one year due to mere recklessness. He considered the Directors' fees a proper charge, because without the supervision exercised by the Board the hypothetical tenant would have to spend at least this amount extra on engineers' salaries.

The RECORDER remarked that the hypothetical tenant was not likely to do without an engineer.

Mr. A. YOUNG: Our contention is that the tenant would be his own engineer.

The RECORDER: That is putting it rather strong. It would restrict the number of possible tenants.

Mr. YOUNG said that what he objected to was the £300 a year Directors' fees.

In further cross-examination, witness admitted, in regard to the tenant's income-tax, that he had written a book in which he had said that this could not be considered as a deduction from the assessment. He said he had not modified that opinion; but in several instances deduction had been allowed.

Mr. *R. E. B. Crompton*, M.Inst.C.E., supported Mr. Newbigging's statements; remarking that that gentleman's evidence was too favourable to the Overseers.

Mr. A. YOUNG then went in detail through the evidence; contending that the accumulators must be considered (in the light of certain well-known cases) as hereditaments, and not as tenant's chattels. He further urged that Directors' fees and income-tax could not justifiably be deducted. He said the Overseers also claimed that at least 20 per cent. should be added to the rateable value of the property for the prospective increase of business.

The RECORDER, having heard the arguments, and the statement of the points on which the Overseers proposed to tender evidence, said there was the question of the Directors' fees, on which, perhaps, it would be desirable to hear something further. Then there were the questions of accumulators and the prospective increased prosperity of the concern.

Mr. YOUNG: Of course, there is also the question of the percentage upon the tenant's capital. We shall have to give evidence on that.

The RECORDER said he was giving the ideas he had up to that point formed, subject to what might afterwards be said on both sides. As at present advised, he had not come to any conclusion as to the accumulators; but with regard to the tenant's income-tax, he should strike this out of the Appellants' case. He should also strike out of both sides of the account the figures with regard to contracts. Then he did not think he could allow anything for the compulsory termination of the concession, put at 2½ per cent. He was not giving a final decision, but just indicating what was in his mind.

At this point, the case was adjourned till the following day. A consultation between the parties subsequently took place, and a settlement was arrived at. This fact was communicated to the Recorder on taking his seat next morning, and the appeal was withdrawn; but the terms were not stated.

The Bristol Town Council and the Water-Works.—On the motion of Mr. H. Davies, seconded by Mr. Twiggs, the Bristol Town Council last Friday week passed the following resolution: "That it is desirable that an effort be made to acquire the undertaking of the Bristol Water-Works Company for the city, and that a Committee be appointed to inquire upon what terms it could be so acquired."

Lecture on Gas Lighting at Swansea.—At the Central Library Lecture Room, Swansea, last Saturday week, Dr. Griffiths inaugurated a winter course of lectures by delivering an address on the "Development and Progress of Gas Lighting." He spoke of the rapid progress made by gas lighting, and said that in Swansea during the past twelve months something like 290 million cubic feet of gas were consumed. The mains extended to more than 70 miles in length; and the quantity of coal used last year was 27,600 tons. By a series of experiments, he next explained the principles involved and the method adopted to obtain the greatest amount of light from the quantities of gas consumed. In showing the advances made in gas lighting, he said that it had now attained to such perfection that ventilators were being fitted over each burner; and he had no doubt that, 50 years hence, people would be astonished to think that gas was ever used without them. He attributed the high price of gas in Swansea to the extraordinary length of the mains, and stated that, while the charge in London was 2s. 6d. per 1000 cubic feet against 3s. 2d. in Swansea, the capital invested per 1000 feet represented in London 10s. 6d. and in Swansea 25s. 2d.

MISCELLANEOUS NEWS.

SOME NOTES FROM AMERICA.

From Our Own Correspondent.

Lawrence, Mass., Oct. 16.

The most important topic of interest among the gas fraternity on my side of the water at the present time is the annual meeting of the American Gaslight Association, called for Oct. 17, 18, and 19 in the City of Washington, in the District of Columbia. The meeting will, it is expected, be of more than ordinary interest. A departure from the beaten track made by the Association this year is well worthy of notice. I refer to the establishment of the Association's Quarterly, which means that, instead of the Association publishing its proceedings once a year, or, as was more frequently the case, bi-annually, under the new order of things the matter reaches the members in four parts each year. This would appear to be a change for the better, as the papers and discussions will thus at an early date be in accessible form for the members. The papers to be read at the forthcoming meeting have all been published in the Quarterly, and will therefore be "taken as read" at the meeting, and each will be open for discussion upon the reading of its title. This it is thought will save time; and thus permit the Association to accomplish more real work. Theoretically, this is all right and proper; but whether theory and practice will work together in the matter is perhaps open to doubt. It is to be feared that many members will fail to read the papers as presented to them in the Quarterly, but will take part in the discussions. If so, the result may not be all that could be desired. However, the forthcoming experience will tend to show whether the "taken-as-read" scheme will work in harmony with the theory of the case. It is to be hoped it will do so.

Another matter which will probably tend to make the meeting important is the fact that doubtless at this time will be decided the fate of the so-called "Federation Scheme," or the plan which has been under discussion for a couple of years to knit together in closer union the various Gas Associations of the country. It will be readily conceded that this scheme offers a vast field for profitable labour. That the various Associations do a vast amount of work each year, producing meagre results in comparison with the expenditure of force, must be generally admitted. It seems very clear that this vast gap between labour and product—between force and effect—could be greatly lessened, and brought down to the most meagre proportions, by some central power directing the work of all the Associations, causing them to act in harmony and unison. Yet efforts in this direction have so far been without fruit; the various Associations fearing that by any consolidation scheme they would lose their individuality. As the project does not abridge the rights of the Associations, but merely binds them together for purposes of conference and investigation, it is quite possible that the several bodies will fall into line, and carry along the scheme, which cannot but be fruitful in good work. As far as the American Gaslight Association is concerned, its fate will doubtless be decided at the meeting, as it is to be expected that the project will be either adopted or voted down.

The Association meet this year, as already noted, in Washington, the capital of the Union; and no more pleasant city could have been selected for such a meeting. Its many hotels offer ample and excellent accommodation for all who may desire their hospitalities. The broad asphalted avenues, lined by magnificent Government buildings and palatial residences, present many attractions for driving and walking; while the suburbs are variedly picturesque. The literary programme covers a wide range, and covers it well. The executive department of the industry is represented by a paper on "The Public Ownership of Gas Properties and Taxation;" while those who are more specially concerned with the practical side of the business will find much of interest in the papers descriptive of "Sundry Methods of Making Water Gas from Bituminous Coal" and "Patching Gasholders while in Use." Those who agree with the maxim "*experientia docet*" will find food for thought in the essays on "A Small Experimental Gas Plant," "Light Wasted in Bad Flames," and "Chemical Technology as Applied to Gas Manufacture." Those who have more direct charge of the selling department will turn with pleasure to the papers on "The Welsbach Incandescent Gas-Burner" and "The Use of Gas for other than Lighting Purposes." Finally, it will not be without interest to your readers if I note that the deliberations of the convention will be presided over by an Englishman—Mr. W. H. Pearson, the Manager of the Toronto Gas Company.

The prepayment gas-meter hardly seems to come in for that favour in America which has been accorded to it in England. Possibly this is due to some slowness of the American gas manager. But certain it is that the new departure does not make great headway in my country; and there seems to be a feeling of surprise that so much should be made of it in England. Possibly the need for it here does not exist to a like degree, because it is well-nigh universal custom to send out gas bills monthly, whereas, if I am not in error, the plan on your side is to send the consumers—excepting, perhaps, the larger ones—a reminder of indebtedness only once a quarter. Where the accounts are rendered monthly, the amount charged to an ordinary customer is not large; and therefore there is not so much necessity for the shilling or quarter-dollar prepayment as where the account is allowed to run for three months. However, our meter makers are already turning their attention in this direction; and probably, in time, we may have many Americanized prepayment meters, and may follow the lead of our Transatlantic friends in this as in some other matters.

Many gas-stove makers have directed their thoughts this year to the improvement of the gas heating-stove; and in this connection it is worthy of note that the gas radiator is coming into general favour. Last year we had merely the radiator with jets of luminous gas burning in the base of the tubes. Then some makers conceived the idea of using a larger burner, placing it in the centre of the radiator, and letting the heated gases pass up and down and up again before escaping into the room. But it was found somewhat difficult to thus force the

heated air against Nature's laws; so this year we have a new style of radiator. Briefly told, it consists of one tube inside another. Through the outer tube the products of combustion pass to the chimney, while through the centre one flows air, which is heated in its passage, and then escapes into the room. These radiators are made in many designs, and are becoming quite popular.

One of the most, if not actually the most, recent surprises the gas business has been treated to is the reported resignation of Mr. J. Edward Addicks from the presidency of the Boston Gas Company. No reason is as yet assigned for this step; but it is stated that a Syndicate composed of New York and Boston people have bought out Mr. Addicks's interest in the Company.

THE OUTRAGES AT THE PLYMOUTH GAS-WORKS.

Statements by Trade Unionists.

As calm follows a storm, so a period of quietness has succeeded the series of agitating events which recently occurred at the Plymouth Gas-Works. Owing perhaps to the vigilant watch maintained, no further attempt has been made to interrupt the ordinary routine of the works. Policemen are still kept on special duty there at night, and on Sundays; but apart from this and the conspicuous display of notices, warning unauthorized persons off the works, and offering a reward for the discovery of the perpetrators of the recent attempts on the plant, there is nothing to indicate that things are not pursuing their usual course. Mr. William Thorne, the General Secretary to the Gas-Workers' and General Labourers' Union, arrived in Plymouth last Sunday week; and, on that and the following days, he addressed a series of meetings in the town and neighbourhood. Several of his speeches were devoted to the subject of affairs at the gas-works.

Although he was not on the spot at the time, and had no personal knowledge of the facts, Mr. Thorne of course had no hesitation in declaring that the whole series of charges was a fabrication, and the reward offered an absurdity. It was said that a shovel, pieces of iron, &c., had been found in the coal-breakers. The shovel was undoubtedly placed there accidentally by one of Mr. West's own men; while, as to pieces of iron, they were always to be found in the coal, and got into the breakers. The charge of interfering with a governor, he dismissed with the remark that none of the general workers knew anything about the governors, and apparently implied that it could only have been tampered with by the foreman, fitters, or engineers. Coming to the attempt upon the holder, he said he could not see what damage the stones could possibly cause. If they were placed on the top of the cups, they would remain there for years without doing any injury. The Engineer knew they were in the position referred to an hour before he acquainted others with the fact; and the allegation that it was done by the men was nothing but a concoction. Buildings were in course of erection near the spot, and hundreds of such stones were lying about. Mr. Thorne went on to "demand" that a full inquiry be made into the matter; and he promised to leave nothing undone to discover the man who placed the stone there. For his part, he was certain that it was not done by any of the men employed on the gas-works; but the whole scare was got up to evoke public sympathy—the management of the gas-works being under the impression that his (Thorne's) visit to Plymouth was the forerunner of a strike. In a subsequent speech, Mr. Thorne invited the Gas Company to institute a public inquiry into the affair. As a counterblast to the Company's offer of a reward of £100 for information as to the perpetrator of the outrages, he said that the Gas Workers' and General Labourers' Union would give £100 to the charitable institutions of the town if it could be proved as the result of an independent inquiry, at which their members would state all they knew about the whole matter, that they had attempted this outrage. This idea of offering another reward seemed to greatly please Mr. Thorne; for he repeated it in other speeches, entirely ignoring the fact that the Gas Company's original offer of a reward evidences their inability, through want of actual proof, to make charges against anyone, whether members of the Union or not. Thorne, however, made the significant admission that friction had taken place between the men and the Company, in consequence of the introduction of machinery. They could not, he must frankly say, fight against the introduction of labour-saving machinery; and the Union would not advise them to strike against it. But up to the present the new plant had not come up to the expectations of the officials; and they wanted to shift the responsibility on to the shoulders of the men.

Many of the statements of Mr. Thorne are too absurd to need refutation. It may, however, be worth while to repeat that none of the annoyances at the works were experienced until Union men were engaged to work in the new retort-house, and until a peremptory stop was put to an attempt of the Union officials to obtain a list of the names of the non-unionists. The allegation that Mr. H. Townsend, the Engineer of the works, allowed the stones to remain in the holder for an hour before calling attention to them is, like a good deal of the rest, purely imaginative. Directly he observed the stones, Mr. Townsend called the attention of a man working close by to the fact, and also communicated with the foreman, and took steps to prevent any further working into the holder. The stones remained in position until the Chairman of the Company arrived; and after this they were removed. It is exceedingly unlikely that they got there by accident. The larger stone weighs 14½ lbs., and was placed on the cup; while the smaller, which weighs 6½ lbs., was so tightly wedged in that some force was necessary to dislodge it. Had they not been removed before the holder was allowed to cup, the probability is that very serious injury would have been done. With reference to another allegation of Mr. Thorne's—namely, that pieces of iron are always to be found among the coal, and get into the breakers—Mr. West says that this happens sometimes in the Midland counties, where coal is delivered in railway trucks as it comes from the collieries. It is not an every-day occurrence even there; and under the conditions which prevail at Plymouth, it is almost impossible for it to occur. There the coal is shovelled out of the holds of vessels into baskets, and then put into bags; so that the large pieces of iron found in the breakers could hardly have got among the coal without their being detected. The suggestion that some of Mr. West's own men had accidentally left a shovel in the breaker is equally ridiculous.

Altogether, Mr. Thorne got little by his visit to Plymouth. No attempt was made to realize his grandiloquent demand for an inquiry into affairs at the gas-works; while the effort to induce men to join the Union appears to have been a conspicuous failure. At one meeting at which the General Secretary had painted a pathetic picture of the hardships attendant upon the lot of chemical workers, and of the blessings which follow in the wake of the Union, one of the chemical workers in his audience boldly said that, so far as the chemical and cement works in that locality were concerned, the employers treated their men with every consideration. Mr. Thorne had, as he announced, come down to create enthusiasm by his presence; but the workers declined to "enthuse." Indeed, he was driven to confess that there was a sad falling off from the blessed state of four or five years ago. Then there was hardly a man who was not a member of the Dockers' or some other Trade Union; now it was sad to find so many hundreds of working men who did not belong to any organization of the kind. It is probably a realization of the fact that power is slipping from them in the "Three Towns" which makes the Union officials so anxious to retain their hold of the men employed at the Plymouth Gas-Works. Mr. West has, however, taken pains to let it be known that the Union will not be allowed to have control of the stoking-machines; and that, while Union men may, if they choose, work side by side with the non-unionists, no unionist will be employed as a minder of the charging and drawing machines.

A NEW GADD AND MASON HOLDER AT THE COLCHESTER GAS-WORKS.

Another three-lift gasholder on the Gadd and Mason patent principle was successfully inaugurated at Colchester last Tuesday. Mr. H. S. Pike, Engineer and Manager of the Gas Company, had invited a considerable number of his professional friends as well as townspeople to be present on the occasion. On assembling early in the afternoon, the party were driven to the gas-works at Hythe, where they were received by the Chairman (Mr. C. Coleman) and Messrs. H. Wittey, George Joslin, and E. Beard, Directors of the Company. The holder having been previously tested with air, was at the time of the visit fu of gas, which Mr. Pike arranged could be discharged into another holder on the works, so as to enable those present to judge of the smooth and efficient working of the new holder, not only in its rapid descent, but when the lifts uncupped. The Chairman of the Company, at the invitation of Mr. Pike, turned the valves connecting both inlet and outlet of the new holder with the old one; and then, in the course of a brief statement as to the Company's requirements in the way of storeage capacity, declared the holder in a fit and proper condition for immediate use.

The holder, which has been erected by Messrs. R. and J. Dempster, Limited, of Newton Heath, Manchester, works in a tank that had been previously occupied by a single-lift holder supported by ten standards. The columns, as well as the holding-down bolts round the tank, were removed; and the foundations were re-used for half of the guide carriages of the new holder. The holder is supported by ten spiral guides on the inner lift, ten on the middle lift, and twenty on the outer lift; and all of them are on the outside of the holder, working in carriages fixed to the channels of the dips and to the tank wall—the latter against the foundation blocks for the original ten columns and ten intermediate blocks provided for the purpose. The capacity of the holder is about 470,000 cubic feet; and each of the lifts is some 90 feet in diameter by 25 feet deep, making the total height of the holder when cupped 72 feet.

After an inspection of the works, the visitors returned to the town, and were entertained at dinner, with the Directors of the Company, at the Cups Hotel. Mr. Coleman occupied the chair; and among those present, besides the other members of the Board, were the Auditors of the Company (Mr. A. K. Francis and Mr. A. Phillips), the Deputy-Mayor (Mr. W. G. Benham), the Borough Engineer (Mr. H. Goodyear), the Water-Works Manager (Mr. C. E. Bland), and Mr. J. L. Watts, J.P. Mr. Jolliffe, of Ipswich, proposed "Prosperity to the Colchester Gas Company;" and the toast was acknowledged by the Chairman and by Mr. Pike. The former gentleman afterwards proposed "Success to the Gasholder Constructors," coupling with the toast the name of Mr. T. E. Priestman, who responded.

It may be interesting, in connection with this matter, to mention that there are 45 spirally guided gasholders now at work and in course of construction by Messrs. R. and J. Dempster. Also Mr. Pike has since reported that the holder was exposed to the full force of last Thursday's gale, and has stood and worked quite steadily. At the time of the maximum force of the storm, the holder was at its full height; and this may be regarded as a very severe trial, proving conclusively the excellence, not only of the design of the holder, but of the manner in which the work was carried out.

EXTENSIONS AT THE LEEDS CORPORATION GAS-WORKS.

Inauguration of a New Holder—The Progress of the Undertaking.

Mr. Alderman Gilston, the Chairman of the Leeds Corporation Gas Committee, had the pleasant task to perform, on Monday last week, of formally bringing into use the new gasholder, which has been erected at the Meadow Lane Gas-Works by Messrs. Clayton, Son, and Co., Limited. This, as will be seen by the following figures, is a tremendous leap in the augmentation of the works' storeage accommodation. Hitherto the Committee could only store 11 million cubic feet of gas; and the present addition raises that figure to 16¼ millions. With this holder capacity at command, they hope to be able to dispense with Sunday labour. The diameter of the holder is 240 feet; and, when full, it will have an elevation of 120 feet, exclusive of the base, which is about 15 feet above the ground.

Before the little ceremony took place, those who had accepted the

invitation of the Committee to be present visited the York Street and the New Wortley works, which are respectively under the charge of Mr. R. H. Townsley and Mr. R. Smith. At York Street there are 380 retorts; and they are all in operation. The sum of £1500 has been recently expended on new purifiers; and an exhauster-house and exhausters have been erected, at a cost of £1200. There are four exhausters, each of which can pass 50,000 cubic feet per hour. These have replaced an obsolete set of steam-jet exhausters. During the past year, the old steam condensers in connection with the jet exhausters have been converted into gas condensers, which has been a great improvement; the condensing power having thus been increased. The alteration of the purifiers has led to a considerable saving in labour and lime, as they do not require to be so frequently changed; and the sulphur impurities have also been much decreased since the new purifiers have been in action—the quantity sometimes being as low as 9 or 10 grains per 100 cubic feet. Fifteen years ago the sulphur impurities were about 22 grains per 100 cubic feet; and now the average may be stated as from 13 to 14 grains. The retorts eleven years ago produced 4500 cubic feet per mouthpiece; the quantity now, in consequence of the improvements which have been made, is about 5800 feet. Leaving York Street, the New Wortley works were next visited. Here the total number of retorts in operation is 784, producing rather more than 4¼ million cubic feet of gas per day; besides which there are 484 retorts which can be called into requisition when necessary. New offices, workshops, and stables have also been erected; and the exhauster-house has been supplemented by two new exhausters in duplicate, each of which will pass 100,000 cubic feet per hour. The Siemens' regenerative furnaces were next inspected; and it was pointed out that, by the use of these, there is a saving of about one-third in coke as compared with the old system, and that an inferior quality can be used. The party then drove to the Meadow Lane works, where they were received by the Manager (Mr. G. Tooley). At these works there are 770 retorts, and of these 650 are in operation. The small plant for coal-testing purposes was inspected; and four new exhausters (each capable of passing 100,000 cubic feet per hour), the new governor-house, and other features of interest were seen.

The visitors then repaired to the gasholder. Here Mr. Alderman Gilston, addressing them, said that the day had been looked forward to for some time by the Gas Committee, as they had been anxious to get this holder in operation so as to put an end to Sunday labour. The tank of the holder was the largest metal one in the world; and the holder itself was one of the largest which would be in operation outside of London. Manchester was building one which would exceed theirs to some little extent; but it was not yet in operation. The iron tank contained no less than 20,000 tons of water. To show the marvellous strides which had been made in the construction of gasholders, he might mention that they had a holder at Sheepscar, with a capacity of 1,900,000 cubic feet, which cost a little above £40,000 in construction. This one, which was so much larger, had cost £34,700. He thought very great credit was due to Messrs. Clayton, Son, and Co., for the successful way in which they had carried through the work. In Leeds, the largest consumption of gas on any one day had been 15¼ millions; now they had storeage for 16¼ millions.

Mr. Alderman Gilston then turned the valve to admit gas to the holder. This having been successfully accomplished, the company adjourned to the drawing-office, where tea was provided.

In the course of some remarks which he subsequently made, Alderman Gilston supplied those present with some interesting information as to the progress of the gas undertaking. In 1871, he said, the Corporation gave to the shareholders of the old Company £763,224 10s. 4d. for their interest in the concern, which was the capital at that time. Since then the capital had been increased by extensions and improvements by half a million of money; and at present it amounted to £1,210,000. In 1871, for every ton of coal carbonized at the works, the capital expended was £7 16s. 8d.; now it was £4 14s., which was a reduction of £3 2s. 8d. There were few undertakings in the country that worked at so low a figure. This was not the only thing. If they went back to 1871, it would be found that at that time there was a leakage of 22·5 per cent.; last year the leakage averaged 9·38 per cent. He put this enormous saving down in no small degree to the fact that their mains had been in the hands of a man who devoted the whole of his time and energy to the work, Mr. Suddaby. Some of them might say that this was a large leakage compared with certain other towns. That was so; but he would undertake to say they could not find a town in England where the leakage was less per mile of main. (A Voice: "Manchester.") He believed that in Leeds they had double the mileage of mains that there was in Manchester. The mains in Leeds would extend more nearly to 1000 than to 900 miles. In 1871, 98,000 tons of coal were carbonized, and £45,000 was paid for it. Last year 250,000 tons were used; the cost being £154,000. In the first-named year, the average price was 9s. 1½d. per ton; and last year it was 12s. 9d. During the period mentioned, a great many changes had taken place in regard to residuals. Some people were amazed how it was that the Committee had had to raise the price of gas; how it was they had lost money in some years. They had always fought against an increase in the price; and it was their wish that the gas should be sold to the consumer at a price which was little more than the cost of production. But first came the strike, which ran up the cost of coal; and then there was a fall in the market for ammonia and tar. In 1883, for every £1 spent on coal, they realized £1 in return for coke, ammonia, and tar. Last year for every £1 spent on coal, they only received 8s. 4d. from the residuals. Just imagine, he said, 11s. 8d. per £1 dropped down on £154,000; and it would be seen where, if there had not been this falling off, they could have obtained a bonus for a reduction in the price of gas. This was a very important matter; and when anyone talked about the loss, he asked them to remember that all the loss had not arisen from bad management, nor because coal had gone up in price, but it had resulted in great measure from the reduced value of the residuals. Last year £61,000 was realized for the residuals; and they paid £154,000 for coal. There was one year—1885—when they had £85,000 for the residuals; and they were using nearly 100,000 tons of coal less. This showed what they had to contend with in respect to the gas undertaking, the magnitude of which he thought was not fully appreciated by the public. The Committee paid £60,000 a year in wages; they employed 1600 men; and they had in use, or in course of repair, no fewer than 90,000 meters at this time. At the end of December last, the loss, in consequence of the coal strike, was close upon £13,000; but at the end of June, they had swept off the deficit, and had a balance over—being profit for the year—of £7363. They were in a fair way, in another year, of getting rid of their debt altogether. They were, he supposed, indebted now to the extent of £30,000; but when he mentioned that the Corporation had a quarter of a million of money in the shape of sinking fund out of the profits of the undertaking, and that they had received between £50,000 and £60,000 of direct profits in the shape of money taken from the funds to reduce the price of gas for the public lamps, he thought his hearers would come to the conclusion that the undertaking had not been of a very unprofitable character. He would undertake to say that the concern was never in a better position than at present; and it was well managed. They had no less than 1500 cooking-stoves in use; and upwards of 600 gas-engines were working in the city. He hoped that in the future, as in the past, they would be able to produce as good and as cheap gas as any other town in the country. If they were to make gas, as in London, of 16 instead of 18 candle power, he would undertake that another £30,000 or £40,000 would be the extent of their profit during the next year. In conclusion, Alderman Gilston remarked that he was obliged to those present for having attended in such numbers; and he hoped they would have a higher appreciation of the great undertaking which the Corporation possessed in their gas-works.

THE BREWERS' EXHIBITION.

The miscellaneous collection of machinery, appliances, and produce used by brewers, maltsters, and others, which is annually submitted to public inspection towards the close of October in the Agricultural Hall, Islington, under the direction of Messrs. Dale and Reynolds, and known as the Brewers' Exhibition, calls for passing notice in our columns from the fact that gas, in its dual capacity of light and heat supplier, enters largely into the ordinary business of the licensed victualler, while without an adequate supply of good water the source of his staple article of trade would be cut off. The great improvements which have been made in the general arrangements of public-houses during the past twenty years have opened the way for a more liberal use of gas and the adoption of more efficient burners; and the exhibition at the Agricultural Hall enables makers of these appliances to show what they can do in the way of improvement. A year or two ago, as noticed in the JOURNAL at the time, regenerative lamps were very much in evidence at the exhibition. This year the special feature was the employment of incandescent gas-burners for the lighting of stands. Some of the arrangements may be briefly described. At one stand there was a row of five beautifully ornamented ground-glass globes, each containing a cluster of three incandescent gas-burners; two similar globes being employed in the illumination of the interior of the stall. The general effect was good; but the lights were a little unsteady. At a neighbouring stand, two lamps, each consisting of three burners, unshaded by globes, but having reflectors above, gave a very brilliant light; as did a similar cluster of three burners under an opal shade close by. The adaptability of the incandescent gas system for outside lighting was demonstrated by a group of burners in a very handsome lamp of crystal glass. Clusters of two, three, and four burners, under opal shades, were doing useful work at a number of stalls. In one case, where single burners were placed in lamps of squat inverted pyramid shape—a kind of small public lamp with the sides converging to the burner support—the general effect was scarcely so good as where single burners shaded were employed. Coming to regenerative lamps, Wenham's were in use at several stalls; while at one, there were no less than nine Siemens lamps—two of them being in large lamps suitable for exterior lighting. The Siemens burners did not at times show to the best advantage, owing to the fluctuation in the gas supply caused probably by a gas-engine in close proximity. At one stall, there was a splendid display of 13 "Vertmarche" lamps, all of different types; and in the arcade leading to the hall, the Deimel Light Company, Limited, made a good show. It is scarcely necessary to add that Messrs. Stott and Co. had their usual stand of gas-governors and other appliances. Messrs. W. Sugg and Co., Limited, at their large stall in the gallery, had a brilliant and thoroughly representative display of gas appliances—burners, high-power lamps, cooking-stoves, &c. The stall of Messrs. Richmond and Co., Limited, also in the gallery, was effectively arranged and well lighted by two groups of three incandescent burners, with shades above them. The other exhibitors of gas-stoves in the gallery were the Davis Gas-Stove Company, Limited, Messrs. Henry Doulton and Co., Messrs. R. and A. Main, and Messrs. S. Clark and Co. The last-named firm had an exceedingly well-arranged collection of their gas heating-stoves, which do not require any flue, gas and oil bar-stoves, and gas mullers. In the arcade, the London Fire Appliance Company showed an assortment of gas-fires fitted with their new patent non-firing-back burner, which was described in the JOURNAL a fortnight ago. It only remains to say that gas-engines were shown by the Campbell Gas-Engine Company, Limited, and the Dawson Gas-Engine Syndicate, Limited; while motors by Messrs. Crossley Bros., Limited, and Messrs. J. E. H. Andrew and Co., Limited, were at work. Well boring was represented by Messrs. C. Isler and Co., Messrs. Le Grand and Sutcliff, and Messrs. A. Williams and Co.; and water pumping and purification, by the Pulsometer Engineering Company, Limited, and Maignen's Filtre Rapide Company, Limited.

The Protection of Gasholders from Frost.—The Manchester Corporation have decided to fit Cutler's patent anti-freezing appliances to the cups of the remaining three-lift gasholders at the Bradford Road station, after testing the apparatus on one of them for the last two winters. The new holder recently inaugurated at Bristol is also, we understand, being similarly protected from frost.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice calling the meeting; and the Directors' report and the accounts for the year ending June 30, which were referred to in last week's issue, were taken as read.

The CHAIRMAN, in moving that the report and accounts be received and adopted, said the shareholders would observe an increase in the capital account of about £1000; but, as the sum of £439 was written off for depreciation, the addition to the expenditure on capital was, in round figures, £560. The amount due for gas and meter rental for the year was about £1000 more than at the corresponding period of last year. This, he believed, resulted from causes which would operate to the same effect in England—bad trade and reduced means. The shareholders would notice, in perusing the balance-sheet, that, comparing the total expenditure on capital account with the amount received on the shares, the latter only showed a margin of about £884 available as working capital; but as the reserve fund of £5000 was also used for this purpose, the Directors were for the present not much inconvenienced. Turning to the revenue account, it would, he said, be seen that, in comparison with the account for the previous year, it was not so favourable; that for 1893, being, as he stated at the time, very good. The cause of this was partly owing to the increase in the exchange of about £850—the milrei (which was nominally of the value of 27d.) only fetching a little more than 9d. He was glad, however, to be able to report that it was now worth about 11½d. The receipts for gas showed the satisfactory increase of £1457, or 9 per cent.; and the income from residual products and fittings was much about the same as last year. The gross increase in the expenditure on revenue account for the year was nearly £2000, made up of the following amounts: Exchange, £850; coal, £523; and working expenses, £626. The cost per ton of coal and cannel delivered on the works was about the same as in 1893. The quantity of gas made per ton of coal carbonized was less; and the amount of gas paid for per ton was also less by 5 per cent. There could be no doubt that the inadequate storeage for gas, as well as the deficiency of other portions of the apparatus at the works, prejudicially affected the economical working and the efficient distribution of the gas; and the plant was becoming incapable of meeting the growing requirements of their consumers. The Directors, having this fact in view, had procured tenders for an additional tank and gasholder, new purifiers, and other works, in order to place them in a position to meet the demand, as well as to produce and distribute the gas more efficiently and economically; and they hoped to have these additions to the plant in operation by the end of the current financial year. Towards paying for these new works, the Directors would have to call up during the year the remaining £5 per share on the 942 (10 per cent.) preference shares already issued, and most probably to raise a further sum of money. Timely notice would be given by the Secretary of the calls to be made on the shares issued or to be issued. Having a valuable concession, and an increasing demand for gas, the Directors were of opinion that the only way to afford satisfaction to the authorities and consumers at Ceará was to give a plentiful supply of good gas, and at as moderate a price as circumstances would allow, having regard to the legitimate interests of the shareholders, which, he might say, were bound up with the efficient discharge of their duties as suppliers of gas in Ceará. In this way, they would also minimize the competition of other forms of artificial light.

Mr. J. DARELL BLOUNT seconded the motion, and remarked that it must be very satisfactory to all interested in the Company to see that the increased business was calling upon the Directors to provide a more efficient and larger plant.

The motion was unanimously carried.

A dividend for the past six months of 5 per cent. on the preference shares (less income-tax) and of 4 per cent. on the ordinary shares (tax free) was then declared; making, with the interim dividend, 10 and 7 per cent. respectively for the year.

On the motion of Mr. BLOUNT, seconded by Mr. A. J. KING, the Directors retiring (Messrs. Horatio Brothers and F. A. Wallroth) were unanimously re-elected.

Mr. KING proposed, and Mr. F. W. BROTHERS seconded, the re-appointment of Mr. Magnus Ohren as Auditor; and this was carried.

Mr. OHREN, having acknowledged the confidence reposed in him, moved a vote of thanks to the Chairman and Directors for their able conduct of the business.

The CHAIRMAN responded, and afterwards moved a vote of thanks to the Secretary (Mr. Guyatt) and the Engineer (Mr. T. M'Making) for the devoted attention they gave to the Company's interests.

Mr. BLOUNT seconded the motion, which was carried unanimously.

The SECRETARY returned thanks for himself and Mr. M'Making; and the proceedings then terminated.

Saltash Water Supply.—Negotiations have of late been opened between the Plymouth Corporation and several of the neighbouring authorities, for a supply of water, of which Plymouth has in ordinary times an abundance, and of which it will have a still larger supply when the storeage reservoir now in progress is completed. One of the applications is from the town of Saltash, which is only some three or four miles from Plymouth, but stands on the Cornish side of the broad river Tamar. The Great Western Railway Company have agreed to the proposal that a pipe shall be carried across the Royal Albert Bridge, the graceful structure which spans the Tamar, and with which all visitors to South Cornwall are familiar. For this convenience, the Company propose to charge £25 per annum. The Plymouth Water Company will supply water at 4d. per 1000 gallons; but they stipulate that a minimum of 36,000 gallons a day shall be taken. This quantity is, in the opinion of the Saltash Corporation, more than is at present required; and negotiations are in progress with a view to getting it reduced.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of September.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 194,121,301 gallons, as compared with 199,725,327 gallons in the corresponding month of 1893. The number of services being 809,585, the rate was 240 gallons to each service. Of the entire bulk of water sent out, 100,779,460 gallons were drawn from the Thames, and 93,341,841 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·7; New River, 1·2; East London (deep well), 1·3; Colne Valley, 1·7; Tottenham, 1·3; East London (river supply), 2·4; Chelsea, 3·2; West Middlesex, Southwark, and Lambeth, 3·3; and Grand Junction, 3·5. The unfiltered river waters contained the following proportions: Thames at Hampton, 4·7; New River Cut, 2·1; and Lea at Angel Road, 3·6. The Thames at Hampton was, on Sept. 7, turbid and yellow in colour. It was chemically superior, but bacterially inferior, to the sample collected on the 11th of August. As delivered by the five Companies drawing from this river, it was in every case efficiently filtered, and much improved in chemical quality. The bacterial improvement effected by the various Companies is expressed by the following percentage numbers: Chelsea, 99·29; West Middlesex, 99·74; Southwark (average of two filters), 99·09; Grand Junction (average of three filters), 98·74; and Lambeth, 99·16. The raw river water of the Lea above Hertford was again of bad bacterial quality, and in this respect was very much inferior to the water of the same river lower down at Angel Road (the intake of the East London Company); but at the latter point the Lea water was superior to the Thames at Hampton. The water of the Chadwell Spring, which mingles with that of the New River Cut just below the intake, contained in a given volume less than 1-60th of the number of microbes present in the New River Cut at that point. After storeage, but before filtration, the mixed Lea, Chadwell Spring, and deep-well water was turbid and very pale yellow; but it was bacterially 35 times purer than the Lea water at the intake. It was also chemically of very good quality, and was efficiently filtered before delivery. The bacterial improvement effected by filtration amounted, on the average of three wells, to 99·13 per cent.; and it was then equal to deep-well water, both chemically and also in respect of freedom from microbes. The water taken from the Lea at Angel Road by the East London Company was turbid and pale yellow in colour. It was of fairly good chemical quality, and was efficiently filtered before delivery; while its bacterial improvement amounted, on the average, to 97·06 per cent. The deep-well waters of the Kent and Colne Valley Companies, and of the Tottenham Local Board of Health, were clear and bright without filtration. The Colne Valley Company's water was softened before delivery, and thus rendered suitable for washing. These waters were all of a high degree of organic purity, and were of excellent quality for dietetic purposes. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, and East London (deep-well) waters were clear and colourless; the New River and East London (river supply), clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river waters, before and after storeage, of the unfiltered gravel water utilized by the Southwark Company, and of the supplies of the various Companies, collected on Sept. 7, 8, 10, and 11, gave the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw and Gravel and Stored River Waters.		
Thames at Hampton	3,080	13·8
„ after storeage for 14·7 days (Chelsea Company)	460	16·1
Gravel water (Southwark Company)	50	16·0
Lea at Hertford	18,200	12·7
New River, Chadwell Spring	300	11·5
„ Cut at Green Lanes	1,360	13·7
„ water after storeage, before filtration	520	14·5
Lea at Angel Road	2,080	14·3
„ after storeage for 15 days	1,360	14·7
Filtered River Water as Supplied.		
Thames—		
Chelsea	22	16·2
West Middlesex	8	14·2
Southwark, No. 2 well	16	15·1
„ „ 8 „	40	14·3
Grand Junction (Hampton general well)	60	14·2
„ (Kew Bridge well)	28	13·8
„ („ south well)	28	14·0
Lambeth	26	14·9
Lea—		
New River, general well	12	14·3
„ No. 2 „	24	13·8
„ No. 7 „	40	14·5
East London, No. 1 Essex well	12	14·3
„ No. 2 „	12	14·3
„ Middlesex well	100	14·5
„ No. 11 bed	24	14·3
„ No. 12 „	52	14·5
Deep Well—		
Kent, new well, Deptford	45	11·3

In their report to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water supplied to London during the past month, as ascertained by tests of samples taken daily on behalf of the Companies, Professors Crookes and Dewar state that of the 175 samples examined, one was recorded

as "clear, but dull;" the remainder being clear, bright, and well filtered. In their general remarks upon the supply, they say: "The cold weather characteristics of the water supply have commenced to appear this season somewhat earlier than usual. The month of September last year was remarkable for an excess of bright sunshine and high temperature—conditions which favour high purity in running water, by stimulating fluviatile vegetation and promoting oxidation of organic matter; whereas the month just past has, meteorologically, contrasted unfavourably in many particulars with the corresponding month of 1893. The temperature has been low, and the amount of sunshine has been deficient; thereby lessening the power of river and lake waters to destroy the traces of organic matter always present. In spite, however, of these unfavourable conditions, usually prevailing during the winter months, the composition of the Metropolitan waters has been very satisfactory. The oxygen required to oxidize the remnant of organic matter left is slightly less than that required in August; and the organic carbon is a shade higher, but only by an amount equal to 1 part in 7,000,000 parts. We have recently adopted certain modifications in the estimation of organic nitrogen, suggested by Dr. Frankland, the author of the combustion process of water analysis. These seem to give more accurate results. The ratio of carbon to nitrogen has been high; showing that the organic matter in the water is mainly of vegetable origin. The results shown by the colour meter corroborate this, and indicate the presence of peaty matters. The rainfall during September over the Thames Valley was deficient to the extent of nearly an inch. The actual amount falling at Oxford was 1·74 inches; the average for 25 years being 2·66 inches."

THE FELIXSTOWE LOCAL BOARD AND THE GAS AND WATER SUPPLY.

A Special Meeting of the Felixstowe and Walton Local Board was held on the 17th inst., to consider the question of acquiring the gas and water works. The minutes submitted set forth that Mr. Isaac Shone, of Westminster, had been appointed to advise on both subjects from an engineering point of view; while Mr. Bassett Hopkins had been consulted on legal matters. Both these gentlemen, it appeared, had advised that a 3 per cent. basis of purchase as proposed by the Water Company was unreasonable, and that the acquisition of the works could only be safely carried out by an Act of Parliament. Consideration of the matter had been adjourned until this meeting, with a view of ascertaining in the meantime whether the Water Company would postpone their application for a Provisional Order till another year. As to the gas-works, the minutes did not show that any further steps had been taken beyond a resolution passed on Sept. 12, to the effect that provision should be made by the Board for the lighting of the district. The Clerk (Mr. F. B. Jennings) now reported that he had written to the Water Company regarding their application for additional powers, and had received an answer from the Secretary (Mr. I. L. Ensor), to the effect that the Directors did not propose to apply for a Provisional Order, but to promote a Bill in Parliament. He also stated that there appeared to be a feeling among the members of the Local Board that the Company were applying for powers in consequence of the Board's action; but this was by no means the case. They would have sought powers last year or the year before, but were unable to do so on account of a legal difficulty in the formation of the Company. This difficulty was only successfully overcome some two months ago; and therefore the Directors were now for the first time in a position to make the application. They asked the Board to remember that they had no wish to sell their property; but Mr. Ensor intimated that they were prepared to treat upon either of two suggested bases, the latter of which would have enabled the Board to have acquired the undertaking without putting the ratepayers to any expense. The letter also pointed out that the fact of the Company now applying for an Act would not in any way affect the negotiations between the two bodies; and having regard to the existence of the negotiations, the Directors were willing to insert in their notices a power for the sale of the undertaking, so that, if an agreement were come to, the Bill might be made use of to carry out the purchase. The discussion began by Mr. C. H. Downes moving a resolution, instructing the Clerk to give notice of an application to Parliament for an Act to empower the Board to furnish a supply of water and to acquire "the undertakings of the existing water supplies for, in, and adjacent to the district," and to report at a meeting of the Board on Dec. 5 the then position of affairs. His argument in favour of taking this course was that, if the Company were allowed to succeed in their application, and the Board purchased afterwards, they would have to pay the costs of the Act, which would have created a considerable goodwill, and enhanced the value of the undertaking. As no one else evinced a disposition to second the resolution, the Chairman (Mr. C. A. Creasy) did so. He thought the Board took a wise step in trying, as a last resort, to postpone the Company's application; but this having failed, the only thing left for them to do was to give the notice now proposed. Mr. F. T. Cobbold pointed out that, in the report of the expert, nothing was said as to the condition of the water supply. He confessed that he could not but admire the commercial enterprise of Messrs. Bugg and Jolly, who, in 1880, purchased the small and trifling water supply then in existence, and who had since greatly increased and improved it. He regretted that the opinion of Counsel did not go more fully into the water supply, and the way it was laid on to the houses. He did not think that any such extreme measure as Mr. Downes suggested was necessary. There was no historical prestige about the Company to make it advisable that they should purchase their undertaking, or to warrant Parliament giving them compulsory powers. The Company had shown considerable enterprise, and had done their best to supply the place with water; but they had had to try four different supplies. Of these three had been abandoned; and though the fourth was said to be good, it had only been in existence six months. Mr. Jolly denied that the Company had abandoned the third supply; and as to the quality, some of the best analysts had reported favourably upon it. In replying upon the discussion, Mr. Downes stated that his resolution had not for its object merely the purchase of the existing works, but the acquisition of a proper water supply for the district. On a division being taken, eight members declared in favour of the motion, and two against it. Resolutions were also passed empowering the Chairman to convene a meeting of ratepayers to sanction the promotion of the Bill, and directing the Clerk to inform the Company of the proposed action of the Board, and to see whether an agreement could not be come to, in order to avoid opposition to the Bill. No motion was made affecting the Gas Company's property.

THE NEW RESERVOIR OF THE SWANSEA CORPORATION.

In last week's issue, we briefly noticed the proceedings at the formal opening of the Upper Lliw reservoir of the Swansea Corporation; and we are now in a position to give the following particulars regarding this important addition to the water undertaking.

The new reservoir is constructed in the shales and sandstones of the coal measures immediately overlying the Upper Pennant series; and the embankment is placed across the River Lliw, two miles above the old Lliw reservoir. The trench is carried down 12 feet below the level of the stream in the centre of the embankment, 60 feet at the deepest portion of the east end, and 90 feet at the deepest portion of the west end of the trench. For about two-thirds its length, the trench is founded in hard shale; the remaining third at the east end being on hard rock. A lining of blue brickwork in cement concrete is provided where the shale required it, to prevent the action of any springs on the puddle. The puddle trench is 26 feet wide at the deepest part, decreasing to 12 feet at the ends and the top of the puddle wall. The total length of the puddle trench is 233 yards, and the quantity of puddle used in the trench and puddle wall is 35,000 cubic yards, or 75,000 tons. The discharge tunnel is 113 yards long, and is driven through the solid strata round the west end of the embankment. The tunnel commences in the valve-shaft, which is constructed of blue brickwork in cement, with a handsome circular-domed valve-house of stone. In this house is placed the machinery for working the valves commanding the discharge from the reservoir. The valves are not operated in the ordinary manner by winch handles and screw gearing, but are worked by direct-acting hydraulic cylinders placed one over each valve; the necessary water pressure being obtained from a spring found on the hillside. The only manual labour necessary to work the valves is to pull over a small lever of the ordinary signal-box pattern, which opens or closes the water ports and raises or lowers the valves. The valves are all in duplicate. Water for the town supply is decanted at two levels 21 ft. 6 in. and 41 ft. 6 in. below the top water-level of the reservoir. The decanting valves are 18 inches in diameter; and at a level of 68 feet, there are 40-inch valves for drawing off the lower portion of the reservoir, or assisting the discharge of flood waters. After the water from the reservoir leaves the tunnel, it passes into the outlet channel, and either flows down the river into the Lliw reservoir, or can be diverted into the gauge basins, where it is measured and sent to Swansea, or into either of the other reservoirs. It is intended to pass all the water in these gauge basins through copper wire gauze screens, which have not yet been erected. The embankment is 75 feet deep in the middle; and on the water side has a stone toe 25 feet high, which contains about 15,000 cubic yards. The embankment on the water side is covered with broken stone; and on this is laid stone-pitching, varying from 12 inches thick at the bottom to 18 inches thick at the top water level. This pitching is to protect the embankment from wave-wash. The inner slope of the embankment is 3 to 1, and the outer slope 2½ to 1, with two benches 30 feet wide and 14 feet wide; the outer slope being soiled, and the whole of the outer portion of the embankment being drained. The embankment is 158 yards wide at its base and 8 yards wide at the top; and it contains about 210,000 cubic yards of material. The overflow weir at the east end of the embankment is of segmental stone steps with moveable stop planks and sluice placed on the top step, and worked from a foot-bridge. The overflow channel consists of 18-inch pitching in the bottom, with 15-inch at the sloped sides; and the weir overflow channels are capable of discharging 12 inches of rainfall per day from the gathering ground—in addition to the discharge from the flood-valves, which alone are capable of emptying the reservoir in three days. The greatest overflow from the reservoir up to date has been at the rate of 17,173,000 gallons per day, equal to a rainfall of 0·75 inch per 24 hours. The height of the overflow weir is 616 feet above Ordnance datum. The average rainfall at this reservoir is 53·42 inches per annum, for the past four years. The following statistics relating to the whole of the Swansea Water-Works may prove interesting: Lower Lliw, water area, 32 acres; contents (present level), 80,800,000 gallons; gathering-ground, 727 acres; greatest depth, 64 feet; approximate yield per day, 200,000 gallons; approximate cost, £113,000. Blaenant Ddu, water area, 25 acres; contents, 127,000,000 gallons; gathering-ground, 735 acres; greatest depth, 57 ft. 4 in.; approximate yield per day, 922,909 gallons; approximate cost, £97,000. Upper Lliw, water area, 35 acres; contents, 305,464,770 gallons; gathering-ground, 1014 acres; greatest depth, 68 feet; approximate yield per day, 1,541,970 gallons; approximate cost, £101,185. The water in the new reservoir is of excellent purity.

Hexham Gas Company.—The Directors of this Company report that the working in the year ending Aug. 31 last resulted in a profit of £1616. Of this sum, £1594 will be available for distribution; and the Directors will recommend, at the annual general meeting to be held on Thursday, the declaration of dividends at the rates of 10 and 7 per cent., the transference of £250 to the renewal fund, and the carrying forward of the balance (£131). The receipts amounted to £4149; the expenditure, to £2533. The works, which are under the management of Mr. Herbert Lees, carbonized 2479 tons of coal; the residual products being 1632 tons of coke, 24,915 gallons of tar, and liquor which was converted into 13 tons 11 cwt. of sulphate of ammonia. For private consumption, 20,719,200 cubic feet of gas were sold in the past financial year; 884,900 feet being used for public lighting.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

When are the troubles at Falkirk to end? Last week it was quite a pleasure to look forward to the arbitration proceedings; but now a fresh hitch has occurred, and the parties are again in the Court of Session. This time it is the Arbitrators who have brought it on. These, as your readers will remember, are, for the Falkirk Joint-Stock Gas Company, Mr. Corbet Woodall, and for the Corporation, Mr. E. Herbert Stevenson. It fell to them to select an Oversman; and their choice was Mr. J. Barr, of Glasgow. Now, whether it was known to the Arbitrators or not, it turns out that they have selected a gentleman with whom the Corporation have been consulting on the subject of acquiring the Gas Company's undertaking, and who was to be one of their principal witnesses. It is certainly a very awkward position in which the Corporation find themselves. On the one hand, they have been deprived of an important witness; and, on the other, they have placed at the head of the arbitration a gentleman who, in the circumstances, can scarcely approach the subject with an unbiassed mind. Without saying that Mr. Barr would willingly lean one way or another, it is, of course, a natural fear that he might not understand the Company's position so well as he would that of the Corporation. In that case, the advantage of having him would lie with the Corporation. But in an arbitration advantage is not to be thought of; what is wanted is justice which cannot be impeached. It would be extremely inconvenient if, after the arbitration was completed, either side should imagine they had not got fair play, and litigation should ensue to have the award set aside. It is therefore desirable that, if that contingency is to be avoided, Mr. Barr's appointment should be challenged at once. This has been done by the Corporation, who have brought an action to have him removed. I understand that the Company do not object to him. The Arbitrators have made their appointment under the statute; and they feel that they cannot recall it after it has been accepted and intimated. Mr. Barr's position is perhaps the most awkward of all. He has been appointed, and has accepted office; and there is no provision for his taking himself out. He declines to resign, but is quite willing to be removed. The question is as to who has the power to remove him; and that is what the Court is being asked to do. The case is to be discussed next week. When the temper of the parties is considered, it will easily be seen that there are possibilities for a good deal of work for the lawyers before the Corporation may enter upon the peaceble possession of the Gas Company's undertaking. On the other hand, if the Judge should be of opinion that he has power to interfere, and exercises the power, the present difficulty may be speedily overcome, and the arbitration not be much delayed by it. The price asked by the Company is £100,000.

Cambuslang, one of the most popular suburbs of Glasgow, is a growing place; and the Cambuslang Gas Company, of which Mr. J. Donaldson is the Engineer and Manager, is flourishing. Last Saturday, the Directors of the Company held a sort of social meeting in the works; the occasion being an official inspection of new plant which has been constructed. The additions consist of a set of new purifiers, 14 feet square, with 12-inch connections and four-way valve; a lime-shed running parallel with the purifiers; a new meter-house; a new boundary wall; and a new boiler. The purifiers and connections were supplied and erected by the Airdrie Iron Company; and the whole work has been done to plans prepared by Mr. Donaldson. During the past five years, the consumption of gas has increased by 50 per cent. This is the necessity for additional plant. The reason why additions have only been required in the purifying department is that in the retort-house the introduction of a semi-regenerative system of retort-settings, of Mr. Donaldson's own design, has led to an increase in the yield per mouthpiece per 24 hours from 7000 to 12,000 cubic feet. This has given a reserve power in the retort-house, which was required. There is great activity in the building trade in the town at present. Should it continue at the same rate, it will not be long before the Company will require a considerable extension in the matter of retorts and gasholders.

I observe that to-day Edinburgh and Leith gas stock was sold on the Edinburgh Stock Exchange at the rate of £31 per £1 annuity. The price payable by the Gas Commissioners, should they resolve, after 1908, to compulsorily redeem all annuities, is fixed at the rate of 28½ years' purchase; so that the market price at present is higher than the holders will receive if the stock be then redeemed. It is probable that the Commissioners were themselves the purchasers to-day. The stock is very seldom in the market; and when it does come, the Commissioners are glad to acquire it, if the rate be reasonable.

The Turriff Gaslight Company have paid their usual dividend for the past year of 5 per cent. During the year, they had a yield of 2,388,000 cubic feet of gas from 236 tons of coal, which is at the rate of 10,118 cubic feet per ton of coal, and is surprisingly large for a very small works. Last year they expended £486 upon renewals at the works, of which £387 was taken out of the revenue for the year.

The *Dundee Advertiser* on Wednesday of this week gave currency in the head-line of an article, though I confess I failed to see it in the body of the article itself, to the statement that electric light was discovered by a Mr. J. Bowman Lindsay of that city. I mentioned the subject in these "Notes" on Aug. 23, 1892, as having been communicated to me by a Dr. Keiller, of Edinburgh, a native of Dundee. It was then Dr. Keiller's intention to have the subject brought forward, and to move in the matter of having a memorial to Mr. Lindsay erected; but he was very soon afterwards cut off by death, and the subject fell into abeyance. Mr. Lindsay was a teacher of languages in Dundee, and was a man of extraordinary parts; his great work, which, however, he left unfinished, being a dictionary in 50 languages.

There are usually some curious remarks by candidates for municipal honours, when addressing meetings at election times. The most peculiar which I have observed this week was by Mr. H. S. Keith, of Hamilton, who, speaking of the thinning of the gas, said it had been suggested to him that furnace gases were getting into the retorts. That, I suppose, if it took place, must have been through cracks in the retorts. Mr. Keith said he had called for an explanation. If such a thing can be established, it is a new matter to me.

Bailie Dr. Cluckie, in an address to his constituents in Greenock on Thursday night, reverted to the subject of the difference in the cost of producing gas in their town, as compared with what it costs in Paisley. He said that he had been advised not to let the matter rest, and that he had obtained an independent report on the balance-sheets of the two undertakings from Mr. J. Nicoll, accountant, which went generally to confirm what he had previously contended. The policy, he submitted, of buying dear coal to produce bad gas, and selling it at a high price for the sake of a comparatively small profit on residual products, had been proved within the past few years to be a failure, owing mainly to the fluctuating price of bye-products; and he thought they should now set about attending to their statutory obligation, which was to make and sell gas for the good of the community. He questioned whether they should charge gas consumers a high price in order that they might be able to hand over an annual sum for the relief of taxation; but he favoured the applying of profits from gas to the extinction of the debt of the Gas Trust. Mr. Nicoll's report showed the cost of gas in Greenock per million cubic feet to be £57 8s. 1d., and in Paisley £52 6s. 1d.; and brought out an annual saving on 225 million cubic feet, by adopting the Paisley method, of £1147 10s. It is impossible not to agree with Dr. Cluckie's general observations; but whether what he alleges takes place at Greenock is the case or not, is another matter.

A period of severe drought, unusual at this season of the year, has come to an end; rain having fallen copiously this week. Some small places have been getting pinched for water; but they will now have relief. Even Loch Katrine, which supplies Glasgow with water, has been drawn down between three and four feet—a most unusual occurrence. The rivers have not been seen so low for, it is said, thirty years. So small has been the rainfall, that in Perthshire, from Aug. 15 to Oct. 23, a period of 69 days, only 1 inch was recorded; whereas the average in the district for the past thirty years, has been 8½ inches.

The members of the Edinburgh, Leith, and Portobello Corporations who are not on the Water Trust this week paid a visit of inspection to the Talla Valley and St. Mary's Loch, to satisfy themselves as to which would be the best from which to obtain an additional water supply. Two days were spent on the function. The subject is at present being put forward at election meetings; but it is not exciting much interest, as there is a large preponderance of public opinion in favour of the Talla scheme, which the Water Trust have already adopted. As the Water Trustees are elected by the Corporations, and a new election will soon take place, it has been considered advisable to lay the subject before the ratepayers, in order that their mind upon it may be ascertained. So far as appearances go, the community are likely to support the Water Trust in the Talla scheme.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 27.

Sulphate of Ammonia.—There has been a great change since the last report; and the symptoms of a rally then announced have developed considerably. Some eager buying has pushed up prices 7s. 6d. to 10s. per ton; and the paucity of available parcels now they are sought for is very remarkable. It is satisfactory to find, too, that the purchases are mainly for consumers' account, and that the speculators have hardly made a start in covering previous sales, no doubt from fear of assisting the upward movement by so doing. The tone generally is good; and the market looks much more healthy—leading to the conclusion that the improvement will continue, notwithstanding the weaker feeling in nitrate, which, it is reported, must eventually affect sulphate values. This latter statement is, however, contradicted by the anxiety to secure forward contracts. But very few contracts are obtainable; and nothing less than £13 would induce makers to consider overtures. Closing values are at £12 10s. to £12 12s. 6d.

LONDON, *Oct.* 27.

Tar Products.—A slightly better feeling pervades this market Benzols are selling more freely; and 90's have been sold at a slight advance. The application of benzols for fortifying gas is evidently removing some of the surplus production. Pitch continues firm, especially for spot delivery. Carbolic acid is somewhat flat; but considerable deliveries on old contracts are being made. Creosote and heavy tar oils are in rather larger demand; but there is no improvement of any moment in prices, which are regulated apparently by their fuel value. Solvent naphtha is slightly weaker; and the same may be said of toluol. Anthracene is in better inquiry, though little new business is reported. Prices are as follows: Tar, 16s. 6d. to 20s. Pitch, prompt, 38s. to 40s.; forward, 35s. Benzols, 90's, 1s. 2½d.; 50's, 1s. 1½d. Solvent naphtha, 1s. 2½d. Toluol, 1s. 3d. Crude naphtha, 5½d. Creosote, liquid, 2½d.; ordinary, 1½d.; salts, 20s. Cresylic acid, refined, 11d.; brown, 9d. Carbolic acid, 1s. 5d. Anthracene, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia.—The firmness noted last week is accentuated. Large transactions have been noted during the week at prices from £12 5s. to £12 15s., less 3½ per cent., with a decided prospect of higher value. Having regard to the important make now going on, stocks are remarkably low. Gas liquor is quoted at 9s. 6d. to 11s.

Georgetown (British Guiana) Gas Company, Limited.—In the report of the Directors of this Company for the half year ended the 30th of June last, which will be presented to the shareholders at their ordinary general meeting to-day, it is stated that the profit for the past six months amounted to £823, which is sufficient to enable the Directors to recommend the declaration of a dividend on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate 4 per cent. per annum, both less income-tax (except upon the dividends payable to the local shareholders). The price of gas has been reduced since the 1st of July from $3·50 to $2·80 per 1000 cubic feet. The Engineer (Mr. T. B. Younger) reports that the works are in good order. The Directors express regret at the loss of the Chairman, Mr. Alfred Williams, and indicate the changes in the directorate consequent thereon.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although with the close of the month there is a hardening tendency in some directions with regard to the better qualities of round coal, there seems to be no probability of any really general upward movement in prices. There is still an absence of any actual pressure of demand, even for house-fire consumption; and collieries consider they are doing very well if they can work five days per week, without putting into stock. Prices in the open market are stronger than they were, to the extent that concessions on list rates are now difficult to obtain. About 11s. to 11s. 6d. represents the full average figure for best Wigan Arley; 10s. to 10s. 6d., for Pemberton four-feet and seconds Arley; and 8s. to 8s. 6d., for common qualities of house coal. Other descriptions of fuel, for iron making, steam, and general manufacturing purposes, continue in but very indifferent demand, with supplies plentiful and competition from outside districts increasing; so that the tendency of prices as regards common round coal and engine fuel is rather in a downward direction than otherwise. It seems tolerably certain that common Yorkshire coal will be pushed into this district, at very low figures; and it is exceptional where more than 7s. per ton is being obtained at the pit mouth, while for shipment from 3d. to 6d. under this figure is being taken in some cases. Engine fuel is readily obtainable at 3s. 6d. to 4s. for common, up to 5s. to 5s. 6d. for the best qualities; and slack, from the Derbyshire district, is offering at 1s. 6d. to 1s. 9d. per ton at the pit mouth.

Northern Coal Trade.—The unsettled weather that has of late prevailed has affected greatly the shipments of coal, and to some extent eased the prices, coming as it did at the time when the demand for coal from Scotland had almost entirely fallen off. Vessels being thrown out of turn, collieries that had depended on them have had at times to take rather lower rates for coal, in order to get orders to keep the pits fully at work; and this has affected the general range of prices. Best Northumbrian steam coal has been quoted as low as 10s. 3d. per ton f.o.b., though the more general price is 10s. 6d. Second-class steam coal varies from 9s. 6d. to 10s. per ton; and steam small coal is now about 4s. 6d. per ton. Best Durham gas coals are quoted at from 7s. 3d. to 8s. per ton f.o.b.; and such contracts as are being made are at about these rates. There is no alteration in the price of manufacturing coals; but the demand from Scotland having fallen off, there is an abundant supply which eases terms in a few instances. Coke is quiet, with only a moderate demand; the price varying from 13s. to 14s. per ton f.o.b. There is no alteration in gas coke; but some large contracts are being negotiated at a slight reduction in price.

Scotch Coal Trade.—The trade is reviving fast. It is found that the miners are working hard, producing 3½ tons each per day, as compared with 2½ tons previously. Much of the material which is being brought up as yet is inferior, owing to its being mixed up with rubbish which has accumulated at the working places. There is a great demand for gas coal; managers being desirous of replacing stocks which were drawn upon during the strike. First-class cannel has been advanced 2s. per ton. The prices quoted are: Main, 8s. 6d. to 8s. 9d.; ell, 9s. 3d. to 9s. 6d.; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. 3d. to 9s. 6d. per ton, f.o.b., Glasgow. These figures, when compared with those of last week, show where the demand has set in. Shipments are improving. For the week they amounted to 88,559 tons—an increase, as compared with the previous week, of 41,351 tons; but a decrease, as compared with the corresponding week of last year, of 128,151 tons. For the year to date, the total shipments have amounted to 3,954,808 tons—a decrease, as compared with the same period of last year, of 2,342,323 tons.

The Liverpool Corporation and the Gas Company.—At the final meeting of the Liverpool City Council for the present municipal year, held on Friday last, there was an animated discussion on a resolution contained in the minutes presented by the Watch Committee. It had reference to the amount outstanding between the Corporation and the Gas Company in respect of the payment for public lighting—a matter which has been alluded to in previous numbers of the JOURNAL. The resolution was: "That if the Gas Company will consent to the amount being paid without prejudice to any question now pending or hereafter to arise between the Company and the Corporation, the sum retained in respect of the increase in the price of gas should for the first half year be paid." Alderman Smith took exception to this resolution; and he thought the question of the price of gas ought to be referred to arbitration—indeed, in his opinion, the whole of the arrangements with the Gas Company required revision. On his proposition, the minutes of the Committee were confirmed, excepting the resolution concerning the Company, which was remitted for further consideration. A report of the discussion will appear in our next issue.

Gas and Electric Lighting at Hastings.—Although the Hastings and St. Leonards Electric Light Company have for some time been advertising that they are supplying the light on the alternating system, which they claim to be safer than any other, their customers have lately had to submit to temporary deprivations of their illuminant. Isolated cases of extinction are, we learn, of frequent occurrence; and a week or two ago, the whole of the electric lights were out for a few minutes. A graver trouble came last Tuesday evening, when the Parade was in darkness until eight o'clock. In the case of those private consumers who have been rash enough to have their gas-fittings removed, candles, &c., have been resorted to in order to obtain light; and the effect has not been cheering. The regret they must feel at their temerity will probably be mingled with vexation when they read the notice issued by the Gas Company of their intention to reduce the price of gas to 3s. 2d. per 1000 cubic feet as from the commencement of the New Year. In the artistically printed circular in which this fact is announced, the Company's Engineer and Manager (Mr. C. E. Botley, Assoc.M.Inst.C.E.) sets forth the many advantages of gas, which, as he points out, presents a ready and convenient means of lighting, ventilating, heating, and cooking by one and the same agent—and one which, moreover, is available at any moment.

Sales of Shares.—Last Wednesday, £7000 of 4 per cent. stock of the *Fylde Water-Works Company* was sold by auction, and realized slightly more than £30 for each £10 of stock.——At a sale of shares at the Mart, Tokenhouse Yard, by Messrs. Fox and Bousfield, on the same day, 1-20th of an Adventurer's share in the *New River Company* was put up in six lots, and realized £4580, or at the rate of £91,600 per share. Some £1 founders' shares in the *Gas Lighting Improvement Company* were sold for £3 each; and some £10 (7 per cent.) shares in the *Southend Water Company*, at £12 10s. and £12 15s.

The Sequel to the Bath-Tax.—At the South-Western Police Court last Thursday, it was incidentally mentioned that Warrant Officer Waller, with the assistance of a broker, had levied a distress upon the goods of Mr. W. H. Edmunds, of Kingswood Road, Clapham Common, for the recovery of £3 3s., the costs awarded to the Lambeth Water Company by the Magistrate (Mr. Denman) on the 10th inst., as recorded in the JOURNAL on the following Tuesday. Mr. Edmunds, it will be remembered, refused to pay the bath-tax, and summoned the Company for cutting off the water to his house. The house is still without a supply, and no steps have been taken to enforce the order for the compulsory closing of the premises on the ground of their insanitary condition consequent upon the absence of water for domestic purposes.

Colonial Gas Association, Limited.—The severe and continued depression in Australia affected the business of this Association during the year ending June 30 last; but the Directors are of opinion that, with a return of prosperity, there is little doubt that the Association will recover its former position. The profit on the working of the twelve months is £3427, including the dividend on the shares held by the Association in the Charters Towers Gas Company. The interim dividend paid in March last amounted to £1119; and after providing for interest on loans, &c., there remained a balance (including the amount brought forward, and the profit on the sale of colonial concessions) of £1914. A dividend for the second half of the year is proposed at the rate of 4 per cent. per annum, free of income-tax. In their report the Directors record with regret the death of their esteemed Chairman (Mr. H. L. Hammack), and state that they have not filled up the vacancy.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 817.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	19–20	..	5 5 0
100,000	10	,,	7½	Do. 7 p. c.	10	13–14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	10–12	–1	13 6 8
200,000	5	11 May	6½	Bombay, Limited	5	6¼–6¾	..	4 16 5
40,000	5	,,	6½	Do. New	4	4¾–4¾	..	5 9 5
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	230–235	+3	4 17 10
180,000	,,	,,	8½	Do. New	100	177–182	..	4 13 4
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	210–215	..	5 2 4
888,500	Stck.	30 Aug.	5	Bristol	100	115–120	..	4 3 4
320,000	20	28 Sept.	11½	British	20	48½–49½	..	4 10 10
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	11½–22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16¾–17½	..	4 17 2
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	6¾–7¼	–¼	2 15 3
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	12 July	8	Cagliari, Limited	20	25¼–26½	..	6 0 8
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	267–272	..	4 15 7
165,000	,,	,,	10	Do. New do.	100	195–200	..	5 0 0
160,762	,,	14 June	4½	Do. 4½ p. c. Deb. do.	100	132–137	..	3 5 8
800,000	Stck.	14 June	13	Continental Union Limited	100	242–247	..	5 5 3
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	210–215	..	4 13 0
535,000	Stck	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	112–117	..	4 5 6
486,090	10	27 July	11	European, Limited	10	22½–23½	..	4 13 7
354,060	10	,,	11	Do. Partly paid	7½	16–17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	248–252	..	4 15 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105–110	+5½	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	277–282	..	3 10 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	180–185	..	3 15 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275–280	+3	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165–170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127–130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132–137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	180–185	+3	3 4 10
3,800,000	Stck.	11 May	12	Imperial Continental	100	228–233	..	5 3 0
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5–5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited	20	15–16	..	5 5 0
150,000	5	30 May	8	Oriental, Limited	5	6¾–7¼	..	5 10 4
60,000	5	13 Sept.	7	Ottoman, Limited	5	4–4¼	..	7 15 6
166,870	10	31 Jan.	2	Pará Limited	10	1⅞–2¼	..	3 17 9
				People's Gas of Chicago—				
420,000	100	2 May		1st Mtg. Bds.	100	104–108	..	5 11 1
500,000	100	1 June	6	2nd Do.	100	98–103	..	5 16 6
150,000	10	11 Oct.	6	San Paulo, Limited	10	9–9½	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	331–336	..	4 12 3
1,350,000	,,	,,	12	Do. B do.	100	280–284	+2½	4 4 6
260,000	,,	,,	13	Do. C do.	100	287–292	..	4 9 0
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156–161	..	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215–220	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	288–293	..	3 8 3
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	230–235	..	3 8 1
654,740	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147–152	..	2 19 2
700,000	50	14 June	8½	Grand Junction	50	120–124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	302–307	..	3 18 2
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	268–273	+1	3 9 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	209–214	..	3 10 1
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	132–135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	382–387	..	3 2 8
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	136–139	+2	2 17 6
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168–173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	155–160	+5	3 15 0
1,155,066	Stck.	14 June	10	West Middlesex	100	275–280	..	3 11 5

Increased Water Storeage for Lancaster.—Last Wednesday, the Lancaster Town Council decided to apply next session for a Provisional Order for the construction of a new storeage reservoir. The site unanimously adopted is Blea Tarn; and a special advantage claimed for it is that it will enable the Corporation, if the supply of their gathering-grounds proves insufficient, to tap the Thirlmere pipes crossing the course. The estimates are yet to be prepared. The new reservoir will be 80 feet above the highest town level.

Disputed Meter Registration at Huddersfield.—At the Huddersfield Borough Court last Wednesday, Dr. F. A. Coward was summoned for having neglected to pay a gas account due to the Corporation. The Town Clerk (Mr. H. Barber) stated that the defendant owed £17 17s.; but the account was made up of three items, and the one in dispute was £12 17s. 2d. Under the Huddersfield Improvement Act, 1876, the register of the meter was evidence of the quantity of gas consumed, unless it could be shown either that the indices had been falsely taken, or that the meter had, by practical test, been found to have registered inaccurately. An attempt had been made on a previous occasion to show that the Corporation had no right to try and enforce payment of an account for gas supplied through a meter which did not bear an official stamp other than that of the Corporation. He might say, on this point, that, as a matter of practice, the meters supplied by the Corporation were stamped by one of the inspectors on being obtained from the makers. If it became necessary to repair them, the stamps were, of course, broken; and the meters were afterwards stamped again by the Corporation. He then called a number of witnesses, including the Gas Engineer and Manager (Mr. W. R. Herring), to show that between Sept. 29, 1893, and April 20, 1894, the register of the meter had been properly taken. Mr. Dransfield (for the defendant) having sustained a long argument with the Clerk to the Magistrates (Mr. C. Mills), who ruled against him on the points raised, said that Dr. Coward had only defended these proceedings on the ground, as he believed, of public duty. If the account of the Corporation was well founded, defendant must have had each of his 14 gas-burners in use for 66 hours a day during the whole period over which the account extended. The fact was that some of the burners had never been used at all, and that he had burnt much less gas than formerly. He submitted that there was an obligation on the part of the Corporation to show that the meter had been properly tested. Mr. Mills advised the Magistrates to the contrary; and the defendant was ordered to pay the amount of the account.

The Local Government Board and Expenditure on Water-Meters.—Several letters have passed between the Water Committee of the Sheffield Corporation and the Local Government Board with reference to the question as to whether expenditure incurred by the Council in providing water-meters may properly be considered as capital outlay. An application having been made for sanction to borrow a further sum of £10,888 for capital expenditure up to March 25, 1895, on water account, the Local Government Board wrote, on Sept. 11 last, that they saw no reason to depart from the decision which they had previously conveyed to the Council—that, in view of the fact that a uniform term of 60 years is allowed for the repayment of loans for any class of works, irrespective of their durability, the Board could not properly sanction a loan for the cost of meters. The Water Committee have passed the following resolution: "That the local members of Parliament, with Sir Frederick Mappin, be requested to consider whether they could exert influence with the Local Government Board which might induce the latter to recede from the position they have taken up on the subject in question."

Proposed Removal of the Works of the Ilfracombe Gas Company.—The shareholders of this Company met last Wednesday, for the purpose of sanctioning the purchase of lands at Hele, with a view of transferring the works thither, and for authorizing the Directors to apply for parliamentary powers to increase the capital, purchase land, sell the existing site and premises adjoining, remove the works, and for all necessary purposes. Mr. T. D. Wivell, the Chairman, said that during the past ten years the make of gas had more than doubled itself; and it was impossible to get along on the present site, if the increase in business continued. The extent of the land which they proposed to purchase was about 40 acres; and the site was in every respect a desirable one. Vessels could discharge at the works; and this would save 9d. per ton cartage and also the harbour dues. A stream passing through the land would also be a great advantage. The price of the site was £6000; and £300 had been paid on deposit, which would be forfeited if the purchase was not completed before Jan. 1 next. It would be necessary to obtain a new Act of Parliament whenever they removed; and it would be better to do so now, because it was possible that in the near future companies like their own might be drawn into contact with public bodies; and it would be well for them to be prepared. Resolutions were unanimously passed sanctioning the purchase, and empowering the Directors to promote a Bill to enable them to carry it out.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

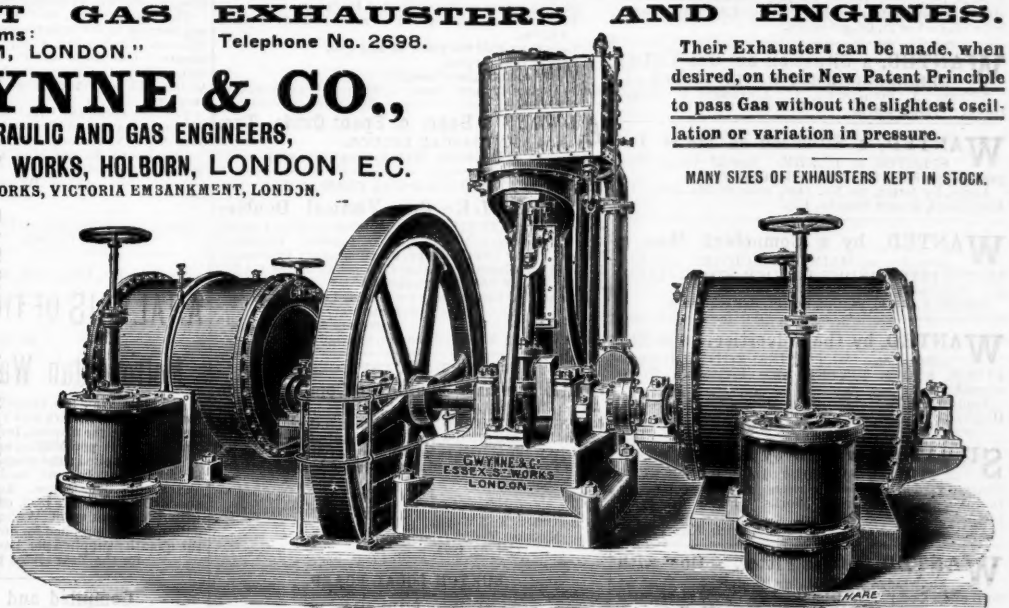
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.



Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton

Catalogues and Testimonials sent on application.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications re OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 719.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 813 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

REDHILL GAS-WORKS ASSESSMENT APPEAL.

THE Report of the Proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been now reprinted in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

NOTICES FOR POSTING IN GAS-WORKS.

CARDS suitable for Exhibiting in Gas- Works, directing Officers and Workmen to REPORT all ACCIDENTS witnessed by them, together with the Clause of the "NOTICE OF ACCIDENTS ACT, 1894," specifying the notice required to be sent to the Board of Trade, can be obtained, *price 4d. each, or 2s. 6d. per dozen, post free.*

Section 4 of the "CONSPIRACY AND PROTECTION OF PROPERTY ACT, 1875," has been similarly printed. It is required, under a Penalty of FIVE POUNDS, that a Copy of the Section shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by persons employed thereat. Copies, in large type, on broad sheets (22½ inches by 17½ inches) may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C. *Price 2s. per dozen; 10s. 6d. per 100.* On Cards the same size as those relating to the "Notice of Accidents Act," *price 4d. each or 2s. 6d. per dozen.*

WANTED, a Situation as Gas-Fitter, BELLHANGER, HOT WATER FITTER, &c. Address A. SCUDAMORE, 13, Alexandra Buildings, Lower Weston, BATH.

WANTED, a Situation as Meter In- SPECTOR or CLERK. Age 25 years. Ten years' experience in a Provincial Gas-Works.
Apply, by letter, to No. 2446, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Competent Man, a Situation as MAIN and SERVICE LAYER, METER FIXER, INDEX READER, STOVE FIXER, &c. Total abstainer.
Address A. B., 46, Station Street, STRATFORD, E.

WANTED, by the Advertiser (age 32), a Situation as METER INSPECTOR, METER-FIXER, STOVE FITTER, &c. First-class Testimonials.
Apply E. H. R., Ashburnham House, South Terrace, HASTINGS.

SITUATION wanted by Manager's Son as FITTER, SERVICE LAYER, and would assist in yard or elsewhere when required. Is competent to take charge of Small Works. First-class Testimonials.
Address W. J. V., 11, South Road, Erith, KENT.

WANTED, a Gas-Fitter. One with knowledge of Smithing preferred. Must be well up in Compo. and Iron Work.
Apply, stating age, experience, and wages required, &c., to FRANK OSMOND, Manager, Gas-Works, DORCHESTER.

WANTED, a steady Man as Gas-Meter INSPECTOR. Must be able to fill up his spare time in repairing Wet and Dry Meters.
Address, stating references and wages required, &c., to No. 2445, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Foreman Stoker wanted, for a Gas-Works (make about 40 millions per annum). Must be a strong, active, handy, and steady man (Teetotaler preferred). Well up in the general duties of a Gas-Works, and especially a good Carbonizer.
Apply, stating experience, wages required, &c., to S. HANN, Gas-Works, Godalming, SURREY.

GAS CARBON—4-ton Loads and up- wards purchased by the BRIMSCOMBE CANNEL COMPANY, Sowerby Bridge, YORKSHIRE.
State Price f.o.r. at nearest Station to Gas-Works.

TEN HORSE Power "Trusty" Gas- ENGINE, by Weyman, FOR SALE. Cost £200 ten years ago. Will be sold for half price, to clear at once. Guaranteed in good working order.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

SCARBOROUGH GAS COMPANY.

FOR SALE—One Vertical Double- Cylinder STEAM-PUMP, suitable for Tar, Liquor, &c., built by Geo. Waller and Co., London. Cylinders 6 in. by 12 in.; Suction-Pipe, 2 in. diameter; Discharge-Pipe, 1½ in. diameter. Also One set of Eight CAST-IRON CONDENSERS complete.
Further Particulars may be obtained on application.
J. HOLLIDAY,
Secretary and Manager.
Gas Offices: 32, Westborough, Scarborough.

RETORT MOUTHPIECES.

THE Merthyr Tydfil Gas Company have to dispose of 60 second-hand 15-inch diameter ROUND MOUTHPIECES, with 6-inch Outlet Sockets cast on. All are fitted with Tangye's Patent Self-Sealing Cast-Iron Lids. Offers for same are invited.
For inspection and further particulars, apply to the undersigned.
JOHN L. COCKER,
Manager and Secretary.
Gas Offices and Works,
Merthyr Tydfil, Glamorganshire,
Oct. 22, 1894.

BUXTON LOCAL BOARD.

TENDERS FOR CANNEL.

THE Gas Committee invite Tenders for the upply of good CANNEL, to be delivered at the Gas Siding, Ashwood Dale, Midland Railway.
Particulars to be obtained of Mr. Smedley, Gas Department, Town Hall, Buxton.
Tenders, endorsed "Tender for Cannel," addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, on or before the 8th of November inst.
By order,
JOSIAH TAYLOR,
Clerk.
Buxton, Oct. 24, 1894.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve Months.
Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Fire-Clay Goods," must be *delivered by post, addressed to the undersigned*, not later than Saturday, Nov. 3 next.
HANCOCK THOMAS,
General Manager
Commercial Street, Sheffield.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

PREPAYMENT METER SYSTEM.

PRECEDENT of Agreement with Land- lord and Tenant (as used at Calne), suitable for general use, 2s. 6d. LEAFLET on the PREPAYMENT METER SYSTEM in conjunction with the fitting up of Small Houses. Single copies, 6d.; twelve, 1s. 6d.; fifty, 4s. 6d.; one hundred, 8s.
G. I. GOUGH, Gas Offices, CALNE.

LOANS at Two per Cent. per Annum Interest to Tradesmen, under 40 years of age, in the Second or Third Year of their Business, in the City of London, or within five miles thereof. Loans of £100 to £300 granted upon unquestionable Sureties being provided.
Apply to G. A. PICKERING, Clerk of Wilson's Trust, Chamber of London, GUILDHALL, E.C.

TAR CONTRACT.

THE Aldershot Gas and Water Company are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works from the 1st of January to the 31st of December, 1895.
Coal consumed, about 7000 tons.
Tenders, marked "Tar," to be addressed to the Secretary, Gas and Water Company, Victoria Road, Aldershot, on or before the 13th of November prox.

PONTYPRIDD LOCAL BOARD (GAS).

CONTRACT NO. 3.

THE Pontypridd Local Board invite TENDERS from experienced Builders for the construction of a RETORT-HOUSE and COAL-STORE, TAR-TANK, BOILER and ENGINE HOUSE, PURIFYING and METER HOUSES, OFFICES, ENTRANCE GATES, RETAINING and BUTTRESS WALLS, and FOUNDATIONS to PILLARS of RAILWAY SIDING, on the Premises of the Local Board at Gwern-y-Gerwn, Treforest, near Pontypridd.
The Specification and Drawings may be seen on application to the undersigned, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester. Quantities and Forms of Tender may be obtained from the latter on deposit of Three Guineas, which will be returned on a *bonâ-fide* tender being received.
Tenders, endorsed "Gas-Works Contract No. 3," to be sent so as to reach me before Noon on Tuesday, the 13th day of November, 1894.
The Board do not bind themselves to accept the lowest or any tender.
By order,
HENRY LL. GROVER,
Clerk.
Local Board Gas Offices, Pontypridd,
Oct. 17, 1894.

Price 15s., Limp Cloth, the Fourteenth Yearly

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1893, or March 31, 1894, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1893.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET.

HARCOURT'S COLOUR TEST.
For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.
The Materials for the above Tests may be obtained from
Mr. S. E. MILLER, 115, Cowley Road, Oxford.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. H. PRICE, Inventor and Patentee, 12, Alwyne Road, Canonbury, LONDON, N.

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
Common Sense *versus* Collectivism 859
A New Sulphate Making-Process 859
The Meeting of the American Gaslight Association 860
The Question of Street Lighting in Liverpool 860
The Free Labour Congress 860
WATER AND SANITARY AFFAIRS—
The London Unification Scheme and the Water Supply 861
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 862
Electric Lighting Memoranda 862
Another "Improved Lowe" Water-Gas Apparatus 863
COMMUNICATED ARTICLE:—
The Question of Economical Gas Enrichment. By A. C. Humphreys and A. G. Glasgow 864
TECHNICAL RECORD:—
Midland Association of Gas Managers—The Autumn Meeting in Birmingham—A Sketch of a Process Affecting Gas Purification and Sulphate Producing. By W. Belton, of Shrewsbury 865
American Gaslight Association—Annual Meeting in Washington—Inaugural Address of Mr. W. H. Pearson 869
The Concrete Wharf at the Brighton Gas-Works 871
The Merrifield-Westcott-Pearson (Improved Lowe) Water-Gas Apparatus 872
The Efficiency of Lights and Lighting 874
CORRESPONDENCE:—
Simple *v.* Complicated Formulæ 876
Theory *v.* Practice 876
The Meter System *v.* Inspection for Detecting Waste of Water 876
LEGAL INTELLIGENCE:—
High Court of Justice—Chancery Division—
Incandescent Gas-Light Company, Limited, *v.* Deimel Light Company, Limited 876
In re the Barcelona (Besos) Water-Works Company, Limited 882
In re the St. Ives (Cornwall) Gas Company, Limited 882
MISCELLANEOUS:—
The New Standard of Light—Lecture by Mr. W. J. Dibdin, F.I.C., F.C.S. 882
The Liverpool Corporation and the Gas Company—Suggested Arbitration 882
The Purchase of the Chesterfield Water and Gas Works by the Corporation—Report by Messrs. Bryan and Woodall; A Bill to be Promoted . 883
The Position of Affairs at the Plymouth Gas-Works 884
Extensions at the Newcastle (Staffs.) Gas-Works 884
Meeting of the Colonial Gas Association, Limited 885
Meeting of the Georgetown (British Guiana) Gas Company, Limited . . 885
The Croydon Corporation and Electric Lighting—An Installation Agreed Upon 886
Electric Lighting Notes 886
Notes from Scotland 887
Current Sales of Gas Products 888
Coal Trade Reports 888
Gas and Water Companies' Stock and Share List 889
PARAGRAPHS.—Mr. A. Brown, 861—Mr. T. Acland, 861—Death of the Borough Engineer of Blackburn, 861—Ystrad Gas and Water Company, 861—Mr. John Harrison, 862—Professor Fleming on "Electric Lamps and Electric Lighting," 862—The Meldrum Forced Draught Apparatus, 862—American Gaslight Association, 862—The Transactions of The Gas Institute, 863—Form of Agreement for Use with the Prepayment System, 864—Southern District Association of Gas Engineers and Managers, 864—The Incandescent Gas-Light Company's New Premises, 864—Mr. J. Hartley, 865—The Value of Various Kinds of Fuel for Raising Steam, 868—The Purification of Hospital Air, 871—An Interesting Relic of the Early Water Supply of London, 874—The Price of Gas in Birmingham, 875—The Finances of the Teignmouth Local Board Gas Department, 876—Reduction in Price, 882—Lead-Poisoning and Waste of Water at Shipley, 882—The New Water-Works for Gloucester, 882—Gas Affairs at Widnes, 884—A Trade Union Secretary in Trouble, 884—Brynmawr and Abertillery Gas and Water Company, 887—The London County Council and the Metropolitan Water Supply, 887—The New Water-Works for Gainsborough, 887—The Position of the Leicester Corporation Water Supply, 888—Electric Lighting at the Heckmondwike Gas-Works, 889—Failure of the Electric Light at the Foreign Office, 889—The Finances of the Leeds Corporation Gas and Water Departments, 889—Additional Purifying Plant at the Chesterfield Gas-Works, 889—The Assessment of the Stourbridge Gas-Works, 889—The Recent Gas Exhibition at Stafford, 889—Improvements at the Nantwich Water-Works, 889—Sales of Shares, 889—The Water Rights of the Halifax Corporation, 889—Gas Explosion at Liverpool, 889—The Softening of the Water Supply at Southampton, 889—Lecture on Gas Distribution at Kidsgrove, 889.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 6, 1894.

Common Sense versus Collectivism.

THE President of the Institution of Engineers and Shipbuilders in Scotland—Mr. John Inglis—is a good hand at an Inaugural Address, which is fortunate for him and for the society, because this particular association keeps its Presidents in office for a longer period than one year, and expects to get several addresses out of them. Mr. Inglis's first address, which was published about this time last year, was very good indeed; and the same may be said of the discourse he pronounced on the 24th ult. Speaking on behalf of the society—whose needs do not differ in this respect from other technical associations—Mr. Inglis was particularly careful to offer a word of encouragement to the contributors of short papers. He said "the import-"ance of a new invention or mechanical arrangement is "hardly to be estimated by the number of words required "to describe it;" and he went on to declare that there is probably no machine of any consequence that is not the sum of many successive increments of invention or discovery [illegible] workers. "It is on evidence that the ingenious thinking

"800 different inventions. How minute some of them must "have been, and yet how indispensable!" The inference is obvious. Whoever, in the course of his work, hits upon a technical advantage, however minute, may do more good by publishing it than he can foresee. Mr. Inglis sees that the soundest progress in an industry is that which is contributed to by littles. "The continual desire to strengthen "the weak parts of an industrial process directs the minds "of many eager searchers to contrivance, until to one a "fortunate solution presents itself, and invention is carried "forward another place. Therefore, the diffidence that "would make us hesitate to bring forward improvements "because they do not appear sufficiently imposing, or "because we may not be able to clothe our thoughts in "words at once elegant and exact, is out of place among "the members of this Institution." These be wise words, and worthy of being held in remembrance.

In the course of his address, Mr. Inglis touched on many topics; but he said in particular something about the educational value of labour-saving machinery in general which we do not remember to have heard before. He said: "In whatever way we may sum up our estimate of "the net effect of labour-saving machinery, there can be "no doubt whatever that its use is, in itself, a constant "stimulus to invention, and that it will continually in-"crease in efficiency, and in encroachment on the province "of manual labour." Mr. Inglis is no Collectivist, but boldly declares his conviction that the nationalizing of the means of production and transit "would bring about "a depression of trade such as has never been experienced, "or even imagined." He deems it rational to hold that the lot of man has been made more tolerable by machinery, his toil lightened, and his opportunities for intellectual and artistic culture increased; but he also thinks that the best results which machinery can compass will not be reaped from its use unless wage-earners of all nationalities will make common cause with capitalists in procuring the withdrawal of all restrictions on the exchange of products and services for money or other considerations, in abolishing tariffs which merely hinder the production of goods in favourable localities, that they may be fabricated in places which are disadvantageous, and, having repressed their own tendencies to wasteful expenditure, in enforcing a like virtue in their Governments, imperial and municipal. "The escape from industrial depression lies in the "removal of all obstacles to the steady increase of con-"suming power, in the setting of rational bounds to mili-"tarism, in the mobility of capital and labour—that co-"operation between production and consumption may be "more readily maintained—and by no means in the "return to universal manual labour, or in attempts to "realize formless dreams of a Government assuming the "functions of the Universal Provider." This setting up of the facilitation of consumption as the sole adequate remedy for trade depression, if not exactly novel in advanced industrial economics, has rarely been surpassed for forceful expression. Mr. Inglis's last words on this subject are: "If Governments will refrain from what is "known by the engaging name of constructive legislation, "and adhere to their primary duty of maintaining security "for person and property, private enterprise, on which "the State itself depends, may safely be trusted with the "work of production and distribution, and the engineer, "as heretofore, with the task of devising the means of "making the necessaries and comforts of life even more "abundant and more generally accessible." Such statements come as a refreshing economic ventilation through the thick atmosphere of modern Collectivism.

A New Sulphate-Making Process.

IN another column we publish the interesting paper read by Mr. W. Belton, of Shrewsbury, at the recent meeting of the Midland Association of Gas Managers, with the discussion upon it. This communication was the feature of the meeting, inasmuch as it was the introduction, to the industry at large, of a new process for "purifying coal gas "and obtaining products therefrom," patented by Mr. Belton and Messrs. G. E. and A. R. Davis, of Manchester. The origin of the process is described by Mr. [illegible] as having been due to the difficulty he experienced in manufacturing sulphate of ammonia at Shrewsbury, owing to

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although with the close of the month there is a hardening tendency in some directions with regard to the better qualities of round coal, there seems to be no probability of any really general upward movement in prices. There is still an absence of any actual pressure of demand, even for house-fire consumption; and collieries consider they are doing very well if they can work five days per week, without putting into stock. Prices in the open market are stronger than they were, to the extent that concessions on list rates are now difficult to obtain. About 11s. to 11s. 6d. represents the full average figure for best Wigan Arley; 10s. to 10s. 6d., for Pemberton four-feet and seconds Arley; and 8s. to 8s. 6d., for common qualities of house coal. Other descriptions of fuel, for iron making, steam, and general manufacturing purposes, continue in but very indifferent demand, with supplies plentiful and competition from outside districts increasing; so that the tendency of prices as regards common round coal and engine fuel is rather in a downward direction than otherwise. It seems tolerably certain that common Yorkshire coal will be pushed into this district, at very low figures; and it is exceptional where more than 7s. per ton is being obtained at the pit mouth, while for shipment from 3d. to 6d. under this figure is being taken in some cases. Engine fuel is readily obtainable at 3s. 6d. to 4s. for common, up to 5s. to 5s. 6d. for the best qualities; and slack, from the Derbyshire district, is offering at 1s. 6d. to 1s. 9d. per ton at the pit mouth.

Northern Coal Trade.—The unsettled weather that has of late prevailed has affected greatly the shipments of coal, and to some extent eased the prices, coming as it did at the time when the demand for coal from Scotland had almost entirely fallen off. Vessels being thrown out of turn, collieries that had depended on them have had at times to take rather lower rates for coal, in order to get orders to keep the pits fully at work; and this has affected the general range of prices. Best Northumbrian steam coal has been quoted as low as 10s. 3d. per ton f.o.b., though the more general price is 10s. 6d. Second-class steam coal varies from 9s. 6d. to 10s. per ton; and steam small coal is now about 4s. 6d. per ton. Best Durham gas coals are quoted at from 7s. 3d. to 8s. per ton f.o.b.; and such contracts as are being made are at about these rates. There is no alteration in the price of manufacturing coals; but the demand from Scotland having fallen off, there is an abundant supply which eases terms in a few instances. Coke is quiet, with only a moderate demand; the price varying from 13s. to 14s. per ton f.o.b. There is no alteration in gas coke; but some large contracts are being negotiated at a slight reduction in price.

Scotch Coal Trade.—The trade is reviving fast. It is found that the miners are working hard, producing 3½ tons each per day, as compared with 2½ tons previously. Much of the material which is being brought up as yet is inferior, owing to its being mixed up with rubbish which has accumulated at the working places. There is a great demand for gas coal; managers being desirous of replacing stocks which were drawn upon during the strike. First-class cannel has been advanced 2s. per ton. The prices quoted are: Main, 8s. 6d. to 8s. 9d.; ell, 9s. 3d. to 9s. 6d.; splint, 9s. 3d. to 9s. 6d.; and steam, 9s. 3d. to 9s. 6d. per ton, f.o.b., Glasgow. These figures, when compared with those of last week, show where the demand has set in. Shipments are improving. For the week they amounted to 88,559 tons—an increase, as compared with the previous week, of 41,351 tons; but a decrease, as compared with the corresponding week of last year, of 128,151 tons. For the year to date, the total shipments have amounted to 3,954,808 tons—a decrease, as compared with the same period of last year, of 2,342,323 tons.

The Liverpool Corporation and the Gas Company.—At the final meeting of the Liverpool City Council for the present municipal year, held on Friday last, there was an animated discussion on a resolution contained in the minutes presented by the Watch Committee. It had reference to the amount outstanding between the Corporation and the Gas Company in respect of the payment for public lighting—a matter which has been alluded to in previous numbers of the JOURNAL. The resolution was: "That if the Gas Company will consent to the amount being paid without prejudice to any question now pending or hereafter to arise between the Company and the Corporation, the sum retained in respect of the increase in the price of gas should for the first half year be paid." Alderman Smith took exception to this resolution; and he thought the question of the price of gas ought to be referred to arbitration—indeed, in his opinion, the whole of the arrangements with the Gas Company required revision. On his proposition, the minutes of the Committee were confirmed, excepting the resolution concerning the Company, which was remitted for further consideration. A report of the discussion will appear in our next issue.

Gas and Electric Lighting at Hastings.—Although the Hastings and St. Leonards Electric Light Company have for some time been advertising that they are supplying the light on the alternating system, which they claim to be safer than any other, their customers have lately had to submit to temporary deprivations of their illuminant. Isolated cases of extinction are, we learn, of frequent occurrence; and a week or two ago, the whole of the electric lights were out for a few minutes. A graver trouble came last Tuesday evening, when the Parade was in darkness until eight o'clock. In the case of those private consumers who have been rash enough to have their gas-fittings removed, candles, &c., have been resorted to in order to obtain light; and the effect has not been cheering. The regret they must feel at their temerity will probably be mingled with vexation when they read the notice issued by the Gas Company of their intention to reduce the price of gas to 3s. 2d. per 1000 cubic feet as from the commencement of the New Year. In the artistically printed circular in which this fact is announced, the Company's Engineer and Manager (Mr. C. E. Botley, Assoc.M.Inst.C.E.) sets forth the many advantages of gas, which, as he points out, presents a ready and convenient means of lighting, ventilating, heating, and cooking by one and the same agent—and one which, moreover, is available at any moment.

Sales of Shares.—Last Wednesday, £7000 of 4 per cent. stock of the *Fylde Water-Works Company* was sold by auction, and realized slightly more than £30 for each £10 of stock.——At a sale of shares at the Mart, Tokenhouse Yard, by Messrs. Fox and Bousfield, on the same day, 1-20th of an Adventurer's share in the *New River Company* was put up in six lots, and realized £4580, or at the rate of £91,600 per share. Some £1 founders' shares in the *Gas Lighting Improvement Company* were sold for £3 each; and some £10 (7 per cent.) shares in the *Southend Water Company*, at £12 10s. and £12 15s.

The Sequel to the Bath-Tax.—At the South-Western Police Court last Thursday, it was incidentally mentioned that Warrant Officer Waller, with the assistance of a broker, had levied a distress upon the goods of Mr. W. H. Edmunds, of Kingswood Road, Clapham Common, for the recovery of £3 3s., the costs awarded to the Lambeth Water Company by the Magistrate (Mr. Denman) on the 10th inst., as recorded in the JOURNAL on the following Tuesday. Mr. Edmunds, it will be remembered, refused to pay the bath-tax, and summoned the Company for cutting off the water to his house. The house is still without a supply, and no steps have been taken to enforce the order for the compulsory closing of the premises on the ground of their insanitary condition consequent upon the absence of water for domestic purposes.

Colonial Gas Association, Limited.—The severe and continued depression in Australia affected the business of this Association during the year ending June 30 last; but the Directors are of opinion that, with a return of prosperity, there is little doubt that the Association will recover its former position. The profit on the working of the twelve months is £3427, including the dividend on the shares held by the Association in the Charters Towers Gas Company. The interim dividend paid in March last amounted to £1119; and after providing for interest on loans, &c., there remained a balance (including the amount brought forward, and the profit on the sale of colonial concessions) of £1914. A dividend for the second half of the year is proposed at the rate of 4 per cent. per annum, free of income-tax. In their report the Directors record with regret the death of their esteemed Chairman (Mr. H. L. Hammack), and state that they have not filled up the vacancy.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 817.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Oct.	10½	Alliance & Dublin 10 p. c.	10	19–20	..	5 5 0
100,000	10	,,	7⅞	Do. 7 p.c	10	13–14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 4
100,000	20	14 June	8	Bahia, Limited	20	10–12	–1	13 6 8
800,000	5	11 May	6¼	Bombay, Limited	5	6¼–6½	..	4 16 5
40,000	5	,,	6½	Do. New	4	4¼–4½	..	5 9 6
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	230–235	+3	4 17 10
180,000	,,	,,	8½	Do. New	100	177–182	..	4 13 4
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	210–215	..	5 2 4
888,500	Stck.	30 Aug.	5	Bristol	100	115–120	..	4 3 4
320,000	20	28 Sept.	11½	British	20	48½–49½	..	4 10 10
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½–22½	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½–17½	..	4 17 2
328,750	10	28 June	2	Buenos Ayres (New) Limited	10	6½–7¼	–¼	2 25 3
200,000	100	2 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	12 July	8	Cagliari, Limited	20	25¼–26¾	..	6 0 8
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	267–272	..	4 15 7
165,000	,,	,,	10	Do. New do.	100	195–200	..	5 0 0
160,762	,,	14 June	4½	Do. 4½ p. c. Deb. do.	100	132–137	..	3 5 8
800,000	Stck.	14 June	13	Continental Union Limited	100	242–247	..	5 5 3
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	210–215	..	4 13 0
535,000	Stck	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	112–117	..	4 5 6
486,090	10	27 July	11	European, Limited	10	22½–23½	..	4 13 7
354,060	10	,,	11	Do. Partly paid	7½	16–17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100	248–252	..	4 15 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105–110	+5	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	277–282	..	3 10 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	180–185	..	3 15 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275–280	+3	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165–170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127–130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132–137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	180–185	+3	3 4 10
3,800,000	Stck.	11 May	12	Imperial Continental	100	228–233	..	5 3 0
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5–5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	109–111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited	20	15–16	..	6 5 0
150,000	5	30 May	8	Oriental, Limited	5	6½–7½	..	5 10 4
60,000	5	13 Sept.	7	Ottoman, Limited	5	4–4½	..	7 15 6
166,870	10	31 Jan.	2	Pará Limited	10	1½–2½	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 May		1st Mtg. Bds.	100	104–108	..	5 11 1
500,000	100	1 June	6	2nd Do.	100	98–103	..	5 16 6
150,000	10	11 Oct.	6	San Paulo, Limited	10	9–9½	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	331–336	..	4 12 3
1,350,000	,,	,,	12	Do. B do.	100	280–284	+2	4 4 6
260,000	,,	,,	13	Do. C do.	100	287–292	..	4 9 0
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	156–161	..	3 2 2
60,000	Stck.	30 Aug.	11½	Tottenham & Edm'nton, "A"	100	215–220	..	5 4 7
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	288–293	..	3 8 3
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	230–235	..	3 8 1
654,740	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	147–152	..	3 9 2
700,000	50	14 June	8½	Grand Junction	50	120–124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	302–307	..	3 18 2
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	268–273	+1	3 9 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	209–214	..	3 10 1
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	132–135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	382–387	..	3 2 8
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	136–139	+2	2 17 6
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	168–173	..	3 9 4
126,500	100	,,	6	Do. D 7½ p. c. do.	100	155–160	+5	3 15 0
1,155,066	Stck.	14 June	10	West Middlesex	100	275–280	..	3 11 5

Increased Water Storeage for Lancaster.—Last Wednesday, the Lancaster Town Council decided to apply next session for a Provisional Order for the construction of a new storeage reservoir. The site unanimously adopted is Blea Tarn; and a special advantage claimed for it is that it will enable the Corporation, if the supply of their gathering-grounds proves insufficient, to tap the Thirlmere pipes crossing the course. The estimates are yet to be prepared. The new reservoir will be 80 feet above the highest town level.

Disputed Meter Registration at Huddersfield.—At the Huddersfield Borough Court last Wednesday, Dr. F. A. Coward was summoned for having neglected to pay a gas account due to the Corporation. The Town Clerk (Mr. H. Barber) stated that the defendant owed £17 17s.; but the account was made up of three items, and the one in dispute was £12 17s. 2d. Under the Huddersfield Improvement Act, 1876, the register of the meter was evidence of the quantity of gas consumed, unless it could be shown either that the indices had been falsely taken, or that the meter had, by practical test, been found to have registered inaccurately. An attempt had been made on a previous occasion to show that the Corporation had no right to try and enforce payment of an account for gas supplied through a meter which did not bear an official stamp other than that of the Corporation. He might say, on this point, that, as a matter of practice, the meters supplied by the Corporation were stamped by one of the inspectors on being obtained from the makers. If it became necessary to repair them, the stamps were, of course, broken; and the meters were afterwards stamped again by the Corporation. He then called a number of witnesses, including the Gas Engineer and Manager (Mr. W. R. Herring), to show that between Sept. 29, 1893, and April 20, 1894, the register of the meter had been properly taken. Mr. Dransfield (for the defendant) having sustained a long argument with the Clerk to the Magistrates (Mr. C. Mills), who ruled against him on the points raised, said that Dr. Coward had only defended these proceedings on the ground, as he believed, of public duty. If the account of the Corporation was well founded, defendant must have had each of his 14 gas-burners in use for 66 hours a day during the whole period over which the account extended. The fact was that some of the burners had never been used at all, and that he had burnt much less gas than formerly. He submitted that there was an obligation on the part of the Corporation to show that the meter had been properly tested. Mr. Mills advised the Magistrates to the contrary; and the defendant was ordered to pay the amount of the account.

The Local Government Board and Expenditure on Water-Meters.—Several letters have passed between the Water Committee of the Sheffield Corporation and the Local Government Board with reference to the question as to whether expenditure incurred by the Council in providing water-meters may properly be considered as capital outlay. An application having been made for sanction to borrow a further sum of £10,888 for capital expenditure up to March 25, 1895, on water account, the Local Government Board wrote, on Sept. 11 last, that they saw no reason to depart from the decision which they had previously conveyed to the Council—that, in view of the fact that a uniform term of 60 years is allowed for the repayment of loans for any class of works, irrespective of their durability, the Board could not properly sanction a loan for the cost of meters. The Water Committee have passed the following resolution: "That the local members of Parliament, with Sir Frederick Mappin, be requested to consider whether they could exert influence with the Local Government Board which might induce the latter to recede from the position they have taken up on the subject in question."

Proposed Removal of the Works of the Ilfracombe Gas Company.—The shareholders of this Company met last Wednesday, for the purpose of sanctioning the purchase of lands at Hele, with a view of transferring the works thither, and for authorizing the Directors to apply for parliamentary powers to increase the capital, purchase land, sell the existing site and premises adjoining, remove the works, and for all necessary purposes. Mr. T. D. Wivell, the Chairman, said that during the past ten years the make of gas had more than doubled itself; and it was impossible to get along on the present site, if the increase in business continued. The extent of the land which they proposed to purchase was about 40 acres; and the site was in every respect a desirable one. Vessels could discharge at the works; and this would save 9d. per ton cartage and also the harbour dues. A stream passing through the land would also be a great advantage. The price of the site was £6000; and £300 had been paid on deposit, which would be forfeited if the purchase was not completed before Jan. 1 next. It would be necessary to obtain a new Act of Parliament whenever they removed; and it would be better to do so now, because it was possible that in the near future companies like their own might be drawn into contact with public bodies; and it would be well for them to be prepared. Resolutions were unanimously passed sanctioning the purchase, and empowering the Directors to promote a Bill to enable them to carry it out.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

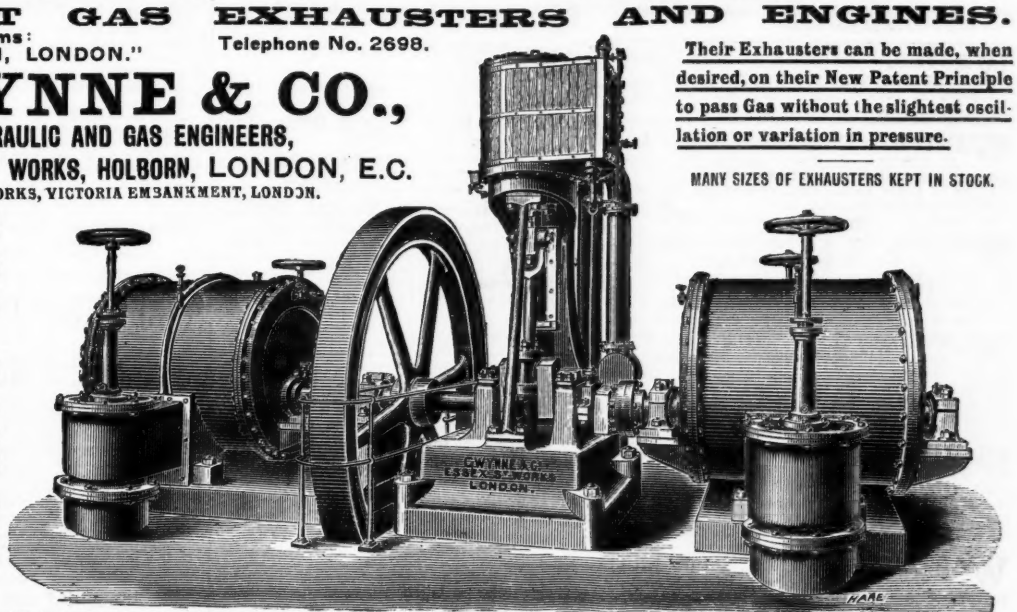
Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton

Catalogues and Testimonials sent on application.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications re OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 719.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 813 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality
Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

REDHILL GAS-WORKS ASSESSMENT APPEAL.

THE Report of the Proceedings at the hearing of the APPEAL of the REDHILL GAS COMPANY against the RATING OF THEIR PROPERTY in Reigate and Nutfield which was published in the JOURNAL has been now reprinted in Pamphlet form; and copies can be obtained, on application to the PUBLISHER, *price 4d. each.*

NOTICES FOR POSTING IN GAS-WORKS.

CARDS suitable for Exhibiting in Gas- Works, directing Officers and Workmen to REPORT all ACCIDENTS witnessed by them, together with the Clause of the "NOTICE OF ACCIDENTS ACT, 1894," specifying the notice required to be sent to the Board of Trade, can be obtained, *price 4d. each, or 2s. 6d. per dozen, post free.*

Section 4 of the "CONSPIRACY AND PROTECTION OF PROPERTY ACT, 1875," has been similarly printed. It is required, under a Penalty of FIVE POUNDS, that a Copy of the Section shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by persons employed thereat. Copies, in large type, on broad sheets (22½ inches by 17½ inches) may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C. *Price 2s. per dozen;* 10s. 6d. *per* 100. On Cards the same size as those relating to the "Notice of Accidents Act," *price 4d. each or 2s. 6d. per dozen.*

WANTED, a Situation as Gas-Fitter, BELLHANGER, HOT WATER FITTER, &c. Address A. SCUDAMORE, 13, Alexandra Buildings, Lower Weston, BATH.

WANTED, a Situation as Meter In- SPECTOR or CLERK. Age 25 years. Ten years' experience in a Provincial Gas-Works. Apply, by letter, to No. 2446, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Competent Man, a Situation as MAIN and SERVICE LAYER, METER FIXER, INDEX READER, STOVE FIXER, &c. Total abstainer. Address A. B., 46, Station Street, STRATFORD, E.

WANTED, by the Advertiser (age 32), a Situation as METER INSPECTOR, METER-FIXER, STOVE FITTER, &c. First-class Testimonials. Apply E. H. R., Ashburnham House, South Terrace, HASTINGS.

SITUATION wanted by Manager's Son as FITTER, SERVICE LAYER, and would assist in yard or elsewhere when required. Is competent to take charge of Small Works. First-class Testimonials. Address W. J. V., 11, South Road, Erith, KENT.

WANTED, a Gas-Fitter. One with knowledge of Smithing preferred. Must be well up in Compo. and Iron Work. Apply, stating age, experience, and wages required, &c., to FRANK OSMOND, Manager, Gas-Works, DORCHESTER.

WANTED, a steady Man as Gas-Meter INSPECTOR. Must be able to fill up his spare time in repairing Wet and Dry Meters. Address, stating references and wages required, &c., to No. 2445, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Foreman Stoker wanted, for a Gas-Works (make about 40 millions per annum). Must be a strong, active, handy, and steady man (Teetotaler preferred). Well up in the general duties of a Gas-Works, and especially a good Carbonizer. Apply, stating experience, wages required, &c., to S. BARK, Gas-Works, Godalming, SURREY.

GAS CARBON—4-ton Loads and up- wards purchased by the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKSHIRE. State Price f.o.r. at nearest Station to Gas-Works.

TEN-HORSE Power "Trusty" Gas- ENGINE, by Weyman, FOR SALE. Cost £220 two years ago. Will be sold for half-price, to clear at once. Guaranteed in good working order. Apply to W. BIRCH, HIGH WYCOMBE.

J. & J. BRADDOCK, Globe Meter Works, Oldham. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c. Telegraphic Address: "Braddock Oldham."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. Telegrams: "ENAMEL." National Telephone 1759. GAS PLANT CEMENT FOR ALL LEAKAGES.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c. Head Office: MIDDLESBROUGH. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR. Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

SCARBOROUGH GAS COMPANY.

FOR SALE—One Vertical Double- Cylinder STEAM-PUMP, suitable for Tar, Liquor, &c., built by Geo. Waller and Co., London. Cylinders 6 in. by 12 in.; Suction-Pipe, 2 in. diameter; Discharge-Pipe, 1½ in. diameter. Also One set of Eight CAST-IRON CONDENSERS complete. Further Particulars may be obtained on application.
J. HOLLIDAY,
Secretary and Manager.
Gas Offices: 32, Westborough, Scarborough.

RETORT MOUTHPIECES.

THE Merthyr Tydfil Gas Company have to dispose of 60 second-hand 15-inch diameter ROUND MOUTHPIECES, with 6-inch Outlet Sockets cast on. All are fitted with Tangye's Patent Self-Sealing Cast-Iron Lids. Offers for same are invited. For inspection and further particulars, apply to the undersigned.
JOHN L. COCKER,
Manager and Secretary.
Gas Offices and Works,
Merthyr Tydfil, Glamorganshire,
Oct. 22, 1894.

BUXTON LOCAL BOARD.

TENDERS FOR CANNEL.

THE Gas Committee invite Tenders for the upply of good CANNEL, to be delivered at the Gas Siding, Ashwood Dale, Midland Railway. Particulars to be obtained of Mr. Smedley, Gas Department, Town Hall, Buxton. Tenders, endorsed "Tender for Cannel," addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, on or before the 8th of November inst.
By order,
JOSIAH TAYLOR,
Clerk.
Buxton, Oct. 24, 1894.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve Months. Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson. The Directors do not bind themselves to accept the lowest or any tender. Sealed tenders, marked "Tender for Fire-Clay Goods," must be delivered by post, addressed to the undersigned, not later than Saturday, Nov. 3 next.
HANBURY THOMAS,
General Manager
Commercial Street, Sheffield,
Oct. 18, 1894.

AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description. Please write for Estimate before ordering elsewhere.

PREPAYMENT METER SYSTEM.

PRECEDENT of Agreement with Land- lord and Tenant (as used at Calne), suitable for general use, 2s. 6d. LEAFLET on the PREPAYMENT METER SYSTEM in conjunction with the fitting up of Small Houses. Single copies, 6d.; twelve, 1s. 6d.; fifty, 4s. 6d.; one hundred, 8s. G. I. GOUGH, Gas Offices, CALNE.

LOANS at Two per Cent. per Annum Interest to Tradesmen, under 40 years of age, in the Second or Third Year of their Business, in the City of London, or within five miles thereof. Loans of £100 to £300 granted upon unquestionable Sureties being provided. Apply to G. A. PICKERING, Clerk of Wilson's Trust, Chamber of London, GUILDHALL, E.C.

TAR CONTRACT.

THE Aldershot Gas and Water Company are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works from the 1st of January to the 31st of December, 1895. Coal consumed, about 7000 tons. Tenders, marked "Tar," to be addressed to the Secretary, Gas and Water Company, Victoria Road, Aldershot, on or before the 13th of November prox.

PONTYPRIDD LOCAL BOARD (GAS).

CONTRACT NO. 3.

THE Pontypridd Local Board invite TENDERS from experienced Builders for the construction of a RETORT-HOUSE and COAL-STORE, TAR-TANK, BOILER and ENGINE HOUSE, PURIFYING and METER HOUSES, OFFICES, ENTRANCE GATES, RETAINING and BUTTRESS WALLS, and FOUNDATIONS to PILLARS of RAILWAY SIDING, on the Premises of the Local Board at Gwern-y-Gerwn, Treforest, near Pontypridd. The Specification and Drawings may be seen on application to the undersigned, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester. Quantities and Forms of Tender may be obtained from the latter on deposit of Three Guineas, which will be returned on a *bond-fide* tender being received. Tenders, endorsed "Gas-Works Contract No. 3," to be sent so as to reach me before Noon on Tuesday, the 13th day of November, 1894. The Board do not bind themselves to accept the lowest or any tender.
By order,
HENRY LL. GROVER,
Clerk.
Local Board Gas Offices, Pontypridd,
Oct. 17, 1894.

Price 15s., Limp Cloth, the Fourteenth Yearly

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1893, or March 31, 1894, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1893.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET.

HARCOURT'S COLOUR TEST.
For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.
The Materials for the above Tests may be obtained from
Mr. S. E. MILLER, 115, Cowley Road, Oxford.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense. For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury LONDON, N.
Prices are Reduced.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

HEATHCOTE GAS COAL.

Rich in Illuminating Power & Yield of Gas.

Above the average in Weight & Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR Co., Ld.,

CHESTERFIELD.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.

Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO.,

Central Plumbing Works, Town Hall Square,

BOLTON.

Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.

Special attention to Repairs.

Seven Saturators placed with us the present Year.

HIGHEST REFERENCES ON APPLICATION.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY.

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,

Spennymoor,

8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,

Yours truly,

A. B. COWAN,

Manager.

For Price, &c., apply to the

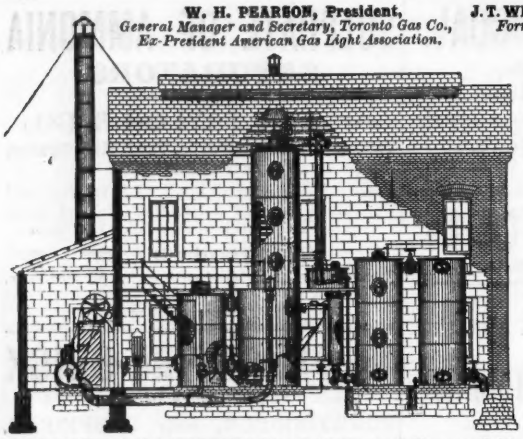
WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

W. H. PEARSON, President,
General Manager and Secretary, Toronto Gas Co., Ex-President American Gas Light Association.

J. T. WESTCOTT, M.E., General Manager & Treasurer,
Formerly Engineer for the United Gas Improvement Company, U.S.A.

L. L. MERRIFIELD, Chief Engineer,
Formerly Engineer for the United Gas Improvement Company, U.S.A.



LOWE WATER-GAS APPARATUS, Merrifield-Westcott-Pearson Setting.

THE
Economical Gas Apparatus Construction Co., Ld.
ENGINEERS AND BUILDERS
OF THE
IMPROVED LOWE
CARBURETTED WATER-GAS PLANT

Designed to give the greatest efficiency when using any kind of Oil, Anthracite Coal, Gas-House or Oven Coke.

MR. WESTCOTT MAY BE CONSULTED AT THE
LONDON OFFICES: SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.

Canada and U.S.A. Offices: TORONTO.

Telegraphic Addresses: "COATESLEE, LONDON." "ECONWEST, TORONTO."

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

SEE ADVT., p. 804 OF LAST WEEK'S JOURNAL; ALSO END PAGE OF NEXT ISSUE.

CLAPHAM BROS., Ld., Keighley, Yorks.

HEBBURN MAIN GAS COALS.
Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LABORLESS WORK
In 1895.

ENGINEERS AND MANAGERS
Making preparations to adopt
SELF-ACTING SYSTEMS OF CARBONIZING
In 1895,
are cordially invited to call and inspect our latest Designs of Automatic Coal and Coke Handling and Charging Machinery.

We send skilled Draughtsmen to get Particulars for Detail Plans.
Address:—
NEW CONVEYOR CO., LTD.,
3 & 4, LIME STREET SQUARE, LONDON, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

IMPORTANT TO GAS COMPANIES.

THE MAXIM CARBURETTOR,

FOR ENRICHING GAS IN BULK.

Used for the last Three Years by all the principal London Gas Companies, and since adopted by numerous Suburban and Provincial Companies and Corporations.

THE CARBURETTOR is INEXPENSIVE, EASILY FIXED, and ENTIRELY SUPERSEDES the use of CANNEL COAL.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

LOW MOOR BLACK BED
GAS COAL.

YIELD OF GAS PER TON . 10,375 CUBIC FEET.
ILLUMINATING POWER . 17·50 SPERM CANDLES.
COKE . . . . . 75 PER CENT.

Prices f.o.r. or f.o.b., on application to
GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

Wrought-Iron

And Fittings and Accessories.

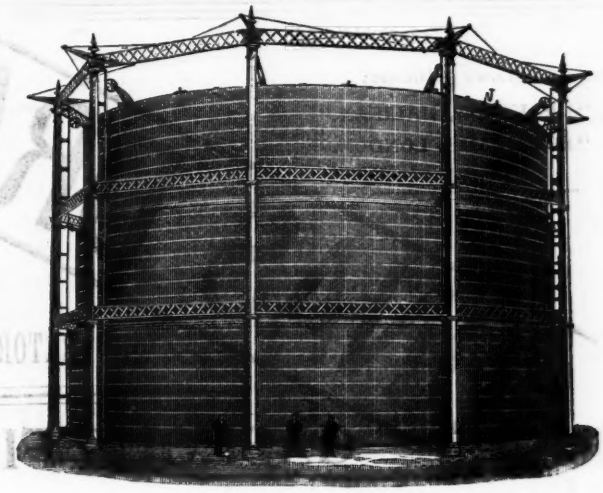
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM
BRASS GAS-FITTINGS GAS-VALVES. STEAM & WATER VALVES TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

JAMES & WILLIAM WOOD, Limited,
GAS COAL AND CANNEL CONTRACTORS AND EXPORTERS,
57, GRACECHURCH ST., LONDON, E.C.
Registered Office—28, ROYAL EXCHANGE SQUARE, GLASGOW.

OIL GAS
BETTER TERMS CAN BE OBTAINED
FROM SUPPLIERS OF OIL
IF PURCHASERS HAVE THEIR OWN
TANK-WAGGONS.

HURST, NELSON, & Co., LTD.,
THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.
REGISTERED OFFICE:
27, ST. VINCENT PLACE, GLASGOW.

TELEGRAPHIC ADDRESS: "ROBUSTNESS, LONDON." EXCHANGE TELEPHONE 1758.
GASEOUS FIRING
FOR LARGE OR SMALL
RETORT-SETTINGS
PLANS, SPECIFICATIONS,
AND ESTIMATES SUBMITTED.
SPECIALTIES
J. & H. ROBUS,
20, BUCKLERSBURY, LONDON, E.C.
ENGINEERS & CONTRACTORS
FOR THE ERECTION OF GAS AND WATER WORKS
COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

HANNA, DONALD, & WILSON,
(Established 1851),
GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,
MAKERS OF
Gasholders and Gas Plant
OF EVERY DESCRIPTION.
Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.
Telegraphic Address: "Donald Paisley."


GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
CXC	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

OVENDEN, HALIFAX.

LONDON OFFICE

60, QUEEN VICTORIA ST., E.C.

Telegraphic Addresses:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON."

Telephone: No. 43.
HALIFAX EXCHANGE.

JONAS DRAKE & SON

GAS ENGINEERS,

CONTRACTORS, IRONFOUNDERS,

RETORT SETTERS, FURNACE BUILDERS, &c., &c.

GASEOUS FIRING A SPECIALTY.

"BEAR CREEK"

The best **KENTUCKY CANNEL** in the Market.

SAMPLE CARGO will demonstrate the extraordinary value of this Coal, and of the resultant Coke and other Bye-Products.

The unlimited quantity and REDUCED PRICE of this Material makes it the most satisfactory and economical Gas Enricher now available.

COKE.—Briefly the "Bear Creek" Cannel produces a first-class Coke—that is, by itself, and unmixed with Coke from Common Coals—merchantable, comparing favourably with Coke from the Standard Gas Coals.

Correspondence solicited. Printed Reports, Analyses, and Samples for Testing sent on application.

For Cargo Prices either c.i.f. or f.o.b. Norfolk or Newport News, Va., or Pensacola, Florida, address

The Log Mountain Coal, Coke, and Timber Company,
PINEVILLE, KENTUCKY, U.S.A.
Cable Address: "HULL, PINEVILLE" (A.B.C. Code).

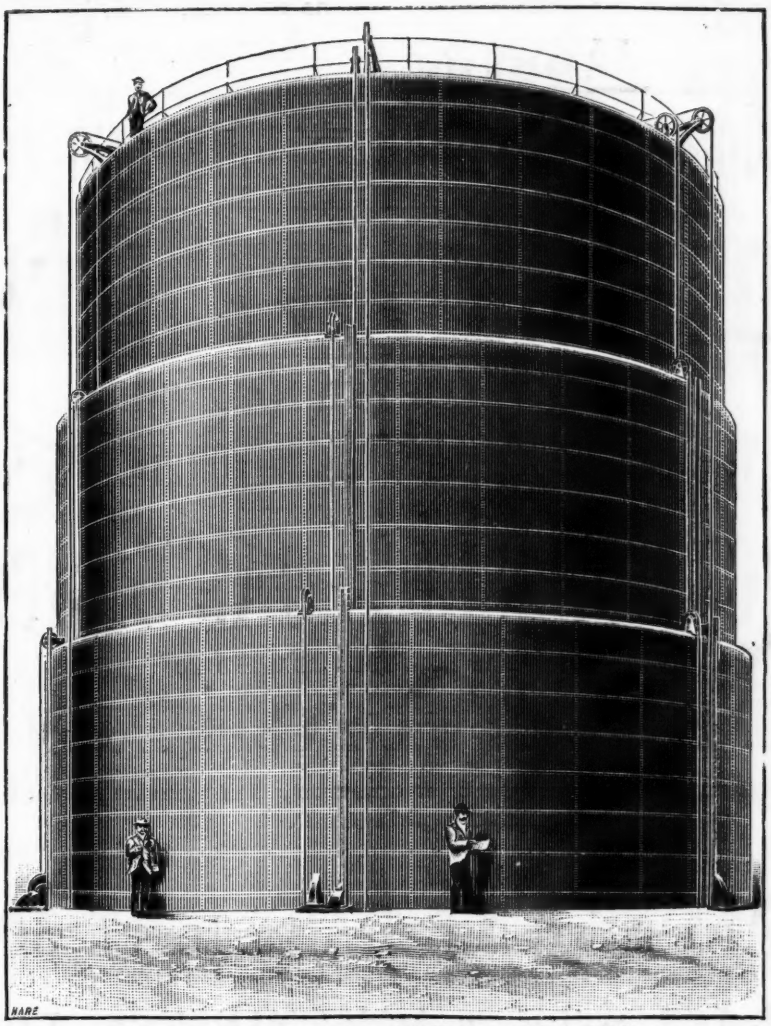
Ashmore, Benson, Pease & Co., Limited,

GAS-WORKS CONTRACTORS, STOCKTON-ON-TEES.

GASHOLDERS ON THE WIRE-ROPE SYSTEM.

Working at the following places:—

Manchester (Four Holders).
Nottingham (Four Holders).
Bathurst (N.S. Wales)
Horsens (Denmark).
Milan (Italy).
Harrogate.
Southborough.
Denton.
Aske.



From a Photograph of Three-Lift Holder at Sligo (1894).

Working at the following places:—

Haslingden.
Darlington.
Pelton.
Tyne Dock.
Newburn.
Birkenhead.
Sligo.
St. Austell.
And many others in America.

London Office:
15, Victoria St., S.W.

Telegrams:
"GASHOLDER, STOCKTON-ON-TEES."

MOBBERLEY & PERRY

Manufacture and supply best quality of **STOURBRIDGE.**

Gas-Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

SPECIAL BRICKS & BLOCKS FOR **GENERATOR & REGENERATOR** FURNACES

FIRE BRICKS, LUMPS, AND TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS, FOR PAVING, &c., &c.

EVERY REQUISITE FOR GAS-WORKS.

Retort Setters sent to any part of the Kingdom.

Contractors for the Erection of Retort-Benches Complete.

HUTCHINSON BROTHERS

GAS ENGINEERS, &c.,

MANUFACTURERS OF

Improved Wet & Dry Gas-Meters.

STATION-METERS. LAMP-METERS.

Test Gasholders and General Gas Apparatus.

Brass Main & Lamp Taps. Unions, Ferrules, &c.

The "Falcon" Lamplighter's Torch. Service Cleansers.

SYPHON AND OTHER PUMPS.

WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.

WET AND DRY METERS REPAIRED.

FALCON WORKS, BARNSLEY.

Telegrams: "HUTCHINSON BROS., BARNSLEY."

TO GAS COMPANIES, CORPORATIONS, AND VESTRIES.

IMPROVED STREET LIGHTING

WITHOUT ADDITIONAL COST,

With THREE to FOUR TIMES the ORDINARY LIGHT,

CAN BE OBTAINED BY

THE INCANDESCENT GAS-LIGHT (Welsbach System)

WHICH HAS NOW BEEN ADAPTED TO

STREET LIGHTING,

And is in use, with great success, in many towns on the Continent.

Send for "Street Lighting" Pamphlet, which gives full particulars, to

THE INCANDESCENT GAS-LIGHT COMPANY LIMITED,

14, PALMER STREET, WESTMINSTER, LONDON.

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

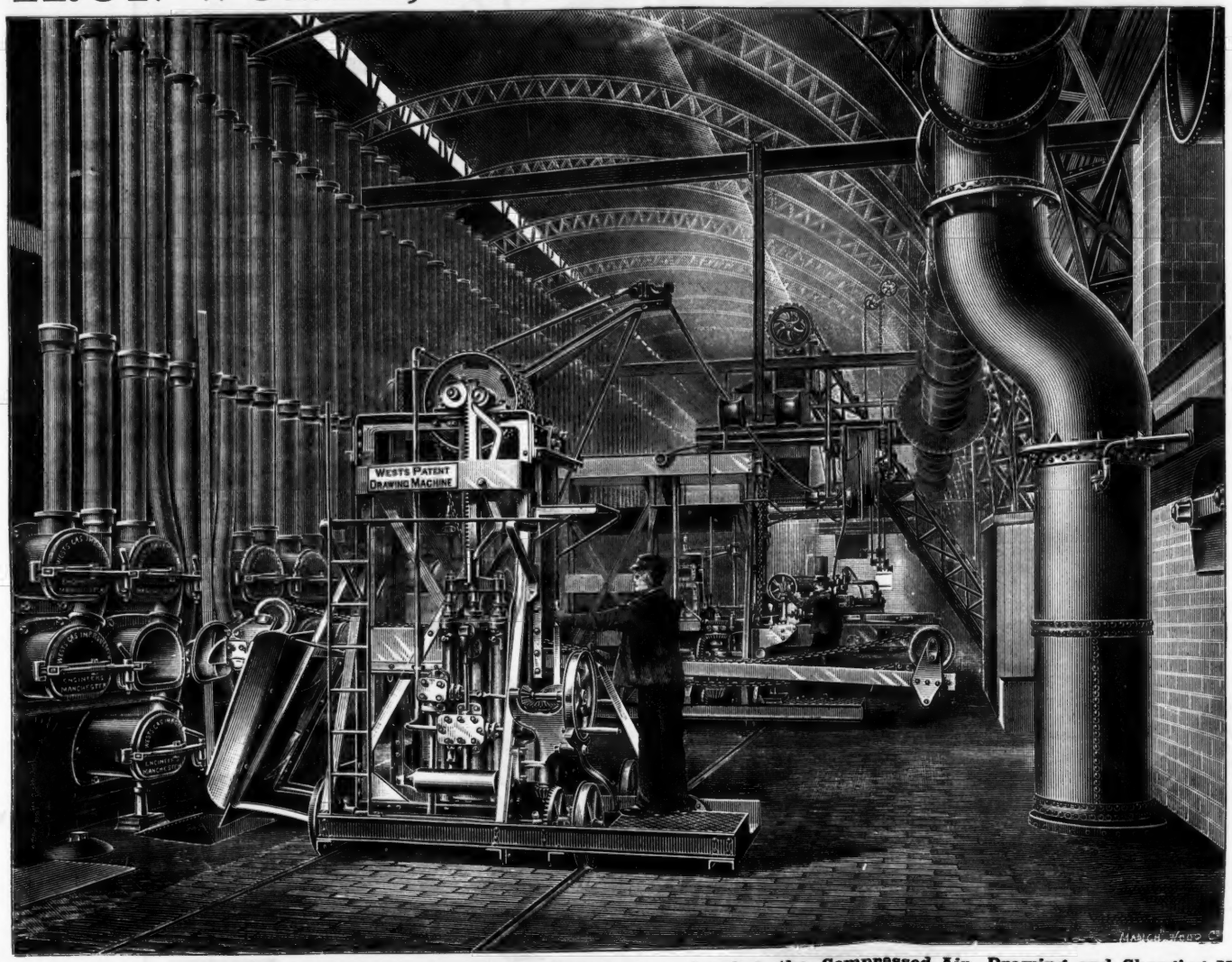
ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

AND

104, Queen Victoria St.,

LONDON, E.C.

WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

LONDON, E.C.

OVER

560,000

LINEAL FEET

OF

RETORTS DAILY

ARE CHARGED AND DRAWN BY

WEST'S MACHINES.

CURLEY CANNEL.

Mr. JOHN METHVEN, Gas Engineer of The Gaslight and Coke Company, Beckton, has tested this famous Cannel, and says:

The above results indisputably place this Cannel at the *head of the list* of the most valuable Cannel raised in this Kingdom."

Particulars, Analysis, and Prices to be had on application to

S. CHANDLER & SONS, PONTYBODKIN, NORTH WALES.

R. DEMPSTER & SONS, LTD.

Every Description of Gas Apparatus.

ELLAND, YORKS.

CLAYTON SON & Co LTD

MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD

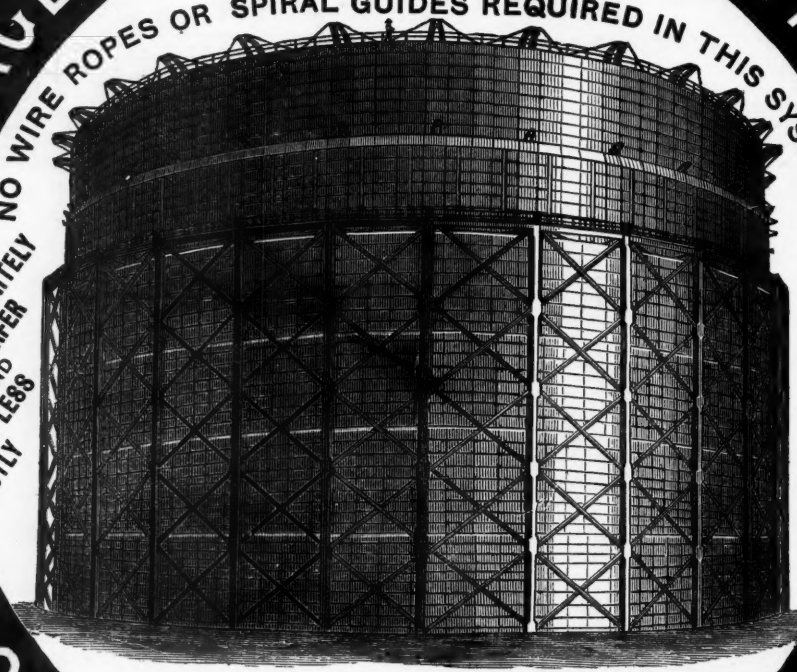
CAPACITY 12 MILLION CUBIC FT

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.

INFINITELY SAFER AND FAR LESS COSTLY

THAN ROPES OR SPIRAL GUIDES.



ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company

IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.

TELEGRAPHIC "GAS. LEEDS.

GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

ALEX. C. HUMPHREYS M.E. A. G. GLASGOW M.E.

TELEGRAPHIC ADDRESS:
"EPISTOLARY, LONDON."

HUMPHREYS & GLASGOW,

Contracting Engineers for

CARBURETTED WATER GAS PLANT,

9, Victoria Street, London, S.W.

United States Office:
64, Broadway,
New York.

Price 21s., Post Free,

PRECEDENTS IN
PRIVATE BILL LEGISLATION
AFFECTING GAS AND WATER UNDERTAKINGS, 1879-90.
Compiled by E. H. STEVENSON & E. K. BURSTAL.

LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

STEEL SCOOPS
FOR
RETORT CHARGING.

Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.

KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Oct. 2, p. 667.]

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING
GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for Oct. 9.

CROWTHER BROTHERS,
Contractors for the Erection of Gas-Works Complete,
RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.

N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.
MAIN LAYING IN ALL ITS BRANCHES.

For Terms and Particulars, apply to
CROWTHER BROTHERS,
152, Teviot Street, St. Leonard's Road,
POPLAR, LONDON, E.
Telegraphic Address: "GASRETORT, LONDON."

Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

W. PARKINSON & CO.

STOVE DEPARTMENT.

TWO GOLD MEDALS.

DERBY, 1891.

WOLVERHAMPTON, 1891.

Several New Patterns are being introduced, combining those qualities for which we have so high a reputation.

FIRST-CLASS FINISH.

HIGHEST HEATING POWER.

ELEGANCE and ECONOMY.

THE "PARKINSON" GAS-FIRE.

Massive and Brilliant. 13-inch Fire Front.

A Grand Stove at a Very Moderate Price.

REGISTERED PATTERN.

PARKINSON'S NEW PATTERN GAS-FIRE FUEL

Is made by a Patent Process, and is an improvement on any Fuel of the kind hitherto made. It produces a Fire of intense heat and radiancy, and does not choke the flame.

Send for Parkinson's New Stove Catalogue.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

(See also Advt. p. 814.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 30, 1894.